Appendix A: Laboratory Quality Assurance Manuals

A1. ALS Environmental Quality Assurance Manual

A2. Columbia Analytical Services Quality Assurance Manual

A1. ALS Environmental Quality Assurance Manual

ALS Environmental

Quality Assurance Manual

Revision 1

Effective: November 30, 2011

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ALS Environmental

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ALS Environmental

Quality Assurance Manual (QAM)

Revision 1

Effective Date; November 15, 2011

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Manual Version:	Revision 1
Effective Date:	November 15, 2011

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NOTE : Supporting documentation that references QAPP, IHQAP, DSQAP and MQAP is referring to this QAM. These references in supporting documents will be updated in the next revision cycle for documents.

1.0 Introduction

1.1 Purpose

This Quality Assurance Manual (QAM) describes the policies, procedures and accountabilities established by the Laboratory of ALS Environmental (ALS) to ensure that the test results reported from analysis of air, water, soil, waste, and other matrices are reliable and of known and documented quality. This document describes the quality assurance and quality control procedures followed to generate reliable analytical data.

This QAM is designed to be an overview of ALS operations. Detailed methodologies and practices are written in ALS Standard Operating Procedures (SOPs). Where appropriate, ALS SOPs are referenced in this document to direct the reader to more complete information. A discussion of ALS SOPs is found in section 3.3 of this manual, and a list of current SOPs and controlled documents is found in Exhibit 11.

ALS maintains certifications pertaining to various commercial and government entities; these are listed in Exhibit 1. Each certification requires that the laboratory continue to perform at levels specified by the programs issuing certification. Program requirements can be rigorous; they include performance evaluations as well as annual audits of the laboratory to verify compliance.

1.2 Quality Assurance Policy

ALS is committed to producing legally defensible analytical data of known and documented quality acceptable for its intended use and in compliance with applicable regulatory programs. This QAM is designed to satisfy the applicable requirements of the State of Utah, United States Environmental Protection Agency (USEPA), American Industrial Hygiene Association (AIHA) policies April 2010, TNI Volume 1 and ISO 17025:2005.

ALS management has committed its full support to provide the personnel, facilities, equipment, and procedures required by this QAM.

ALS management is committed to improvements of the management systems through compliance with its own policies and procedures and ALS management is also committed to compliance with requirements related to current EPA CLP SOWs, DoD QSM, DOE QSAS, and other client and project related requirements.

ALS management is committed to continually improving the effectiveness of the management and quality systems by implementing the requirements of this quality manual.

ALS management reviews its operations on an ongoing basis and seeks input from staff and clients to make improvements.

It is the policy of ALS that all employees be familiar with all quality documentation as specified in section 2.1.

1.3 Policy on Waste, Fraud, and Abuse

ALS policy on waste, fraud, and abuse is described in ALS SOP CE-GEN-001, “Laboratory Ethics and Data Integrity.” It is the policy of ALS to generate accurate and reliable data in accordance with contractual and regulatory requirements.

It is also the policy of ALS to perform work for clients in the most efficient manner possible, avoiding waste of resources. It is the role of both ALS management and employees to ensure that work for clients is performed most efficiently and effectively by properly utilizing ALS purchased materials, equipment, and the time and ability of personnel.

1.4 Quality System

This QAM and SOPs referenced in this document comprise the ALS management system. This management system includes all quality assurance policies and quality control procedures. Review of the Management System is completed on an ongoing basis as described in ALS SOP LAB-026 “Management Review.”

The structure of documentation supporting this management system is outlined in section 2.1.

1.5 Client Confidentiality

Documents provided to the laboratory are held in strict confidence by project management staff. Documents pertaining to quality assurance and analytical requirements are reviewed with appropriate managers and staff through the project specific meetings and Horizon profiles. Project related information provided by clients is securely archived using procedures described in the ALS SOP LAB-013 “Archives.”

The transmittal of final results is specified in Horizon profiles and followed unless specific changes are made to the Project Manager assigned to the client/project. Client communication procedures and documentation requirements are listed in ALS SOP LAB-023 “Client Communication.”

1.6 Data Integrity Policies

ALS policy is described in ALS SOP LAB-050, “You and the Management System” and CE-GEN-001, “Laboratory Ethics and Data Integrity.” It is the policy of ALS to generate accurate and reliable data in accordance with contractual and regulatory requirements. As stated in the ALS policies manual, any undue pressure applied to employees in the performance of their duties must be reported as per procedures for reporting listed in ALS SOP CE-GEN-001. It is against ALS policy to improperly manipulate or falsify data or to engage in any other unethical conduct as defined in ALS SOP CE-GEN-001. ALS provides mandatory initial and annual refresher training for all employees on SOP CE-GEN-001, “Laboratory Ethics and Data Integrity.”

The pertinent ALS Project Manager must approve deviations from contractual requirements. The Project Manager obtains approval for any such deviations, either in writing or by phone (documented in a phone log) from pertinent contract authorities. In addition, ALS requires that deviations from contractual requirements that might affect data quality be reported to clients. Any employee who knowingly manipulates and/or falsifies data or documents or engages in any unethical conduct is subject to immediate release from employment.

ALS employees who are aware of, or reasonably suspicious of, any case of data manipulation, falsification of data, waste of resources, or other unethical practice or misconduct shall notify any manager. Under the direction of the laboratory director, every allegation of unethical conduct will be fully investigated.

1.7 Communication

Although verbal communication with employees is essential, written and visual communication through email and computer systems is the cornerstone of effective communication at ALS. Computer workstations throughout the lab provide access to Horizon, ALS On-Line and email systems. All information essential for effective and consistent communication of analytical requirements and details affecting quality is available through these computerized systems.

2.0 Laboratory Organization and Responsibilities for Quality Assurance

2.1 Laboratory Organization

The Laboratory is organized around the functions described in the following sections. Exhibit 2 of this QAM contains a detailed organization chart for this laboratory. The laboratory is part of ALS USA Corp and the Laboratory Director reports to the Director of Operations, USA. There are other support functions such as human resources, accounting, safety oversight and computer systems that are provided to the laboratory by corporate entities but none of which is responsible for managing laboratory activities. The support functions of this laboratory involved with testing and services are under the direction of the laboratory director.

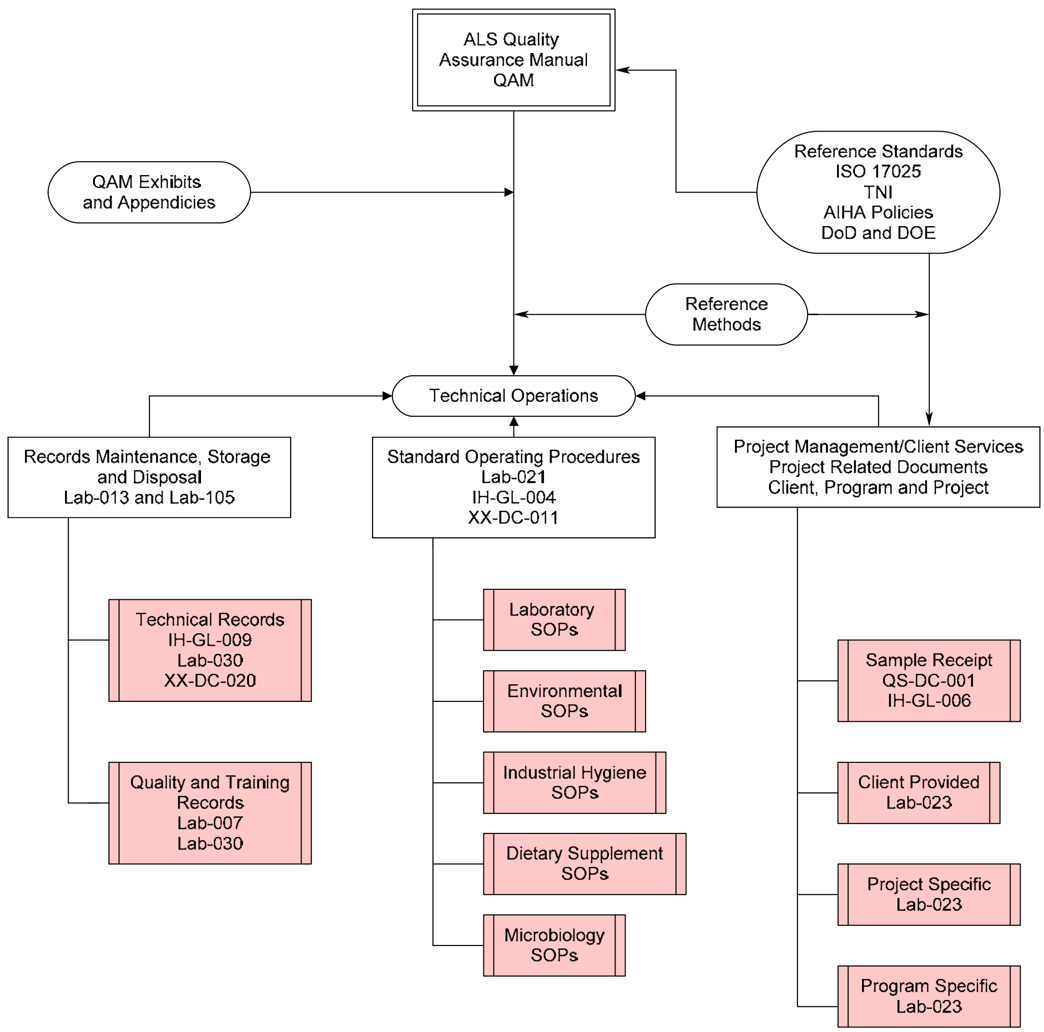
Each of these organizational elements has specific responsibilities for quality assurance in the laboratory. All employees are assigned a minimum set of management system documents which includes this quality assurance manual along with various management systems and technical SOPs as listed in ALS SOP LAB-006, “Training.” Other documentation associated with projects is distributed through project management and Horizon profiles as per ALS SOP LAB-023, “Client Communication.”

All employees are required to implement the policies and procedures as assigned.

This QAM is implemented through the distribution and hierarchy of the document system at ALS. ALS SOP LAB-050 “You and the Management System” describes the functional relationships of personnel to the management system.

The following flow chart diagrams the structure and relationship of documents used to implement quality policy at ALS.

ALS Environmental Documentation Hierarchy



2.2 Responsibilities for Quality Assurance

2.2.1 ALS Laboratory Director

The Laboratory Director is responsible to ensure:

- Implementation of quality policy and applicable standards.
- Employees have sufficient experience and training to perform QAM-related duties and procedures.
- That the necessary facilities and equipment are available to meet the commitments of the laboratory.

- Sample handling, instrument calibration, sample analysis, and related activities are conducted and documented as described in this QAM, its related Standard Operating Procedures (SOPs), and its referenced methods.
- That routine QC samples are prepared, analyzed, and reviewed as required by this QAM.
- That at regular intervals audits are conducted and documented to assess compliance with this QAM.
- That corrective action is initiated and completed to remedy discrepancies or problems identified in any laboratory process.
- Management review of all processes and procedures associated with the management system.

2.2.2 Quality Assurance Manager

The Quality Assurance Manager reports directly to top management and is responsible to:

- Ensure implementation of quality policy and applicable standards.
- Understand, monitor and evaluate the quality assurance (QA) and quality control (QC) activities described in this QAM and its references, reporting deficiencies and identifying resource requirements to the Laboratory Director.
- Conduct and document an annual internal audit of laboratory procedures to ensure compliance with this QAM and its references.
- Conduct an annual update of this QAM and review or update laboratory Standard Operating Procedures (SOPs).
- Arrange for the analysis of demonstration of competency (DOC) and performance evaluation (PE) samples.
- Maintain a record of ongoing personnel training for QAM-related activities, reporting training deficiencies to the Laboratory Director.
- Maintain the laboratory documentation of nonconformance, corrective action, preventive action and improvement programs.

2.2.3 Inorganic Chemistry and Organic Chemistry Managers

The managers of these operations report directly to the Laboratory Director and are responsible to:

- Ensure implementation of quality policy and applicable standards.
- Read, understand and follow this QAM with its references.
- Ensure that each set of reported results meets the requirements specified in this QAM and meets the client's requirements as defined in the applicable project requirements.
- Ensure that personnel are trained, authorized and utilized effectively.

- Ensure that facilities and equipment are maintained and utilized effectively.
- Ensure that supplies are available and utilized effectively.
- Immediately report technical and quality problems to the Laboratory Director or Quality Assurance Manager.

2.2.4 Project Managers

Project Managers report directly to the Laboratory Director. Project Managers are especially involved in the production and assurance of quality results. Client communication procedures and documentation requirements are listed in the ALS SOP LAB-023, “Client Communication.” Project Managers are responsible to:

- Ensure implementation of quality policy and applicable standards.
- Complete and distribute project related information for each project before the laboratory starts work on the project.
- Immediately communicate to the laboratory changes made to projects in progress and document these changes as appropriate.
- Respond to client requests for information and coordinate responses to client audits.
- Ensure Horizon work orders are reviewed and meet client project requirements before release to the laboratory.
- Perform an initial review of results for large projects to verify that data reports submitted to the client meet all project requirements.

2.2.5 Computer Support

Computer Support personnel are responsible to:

- Specify, procure, and maintain all computer hardware and software used at ALS.
- Program and maintain the ALS Laboratory Information Management System (Horizon).
- Perform backups and safely archive stored data.
- Document all changes to computer hardware and software at ALS.

2.2.6 Technical and Support Staff (Analysts and Technicians)

It is the responsibility of all technical and support staff to comply with all procedures and be familiar with current quality systems and policies as established by management. To comply with these requirements, analysts are responsible but not limited to the following:

- Follow project requirements as delineated by project managers to ensure analyses are performed as requested.
- Develop knowledge and understanding of the QAM requirements under which samples are analyzed.
- Notify managers and Quality Assurance personnel when QA problems arise.
- Follow Quality Assurance requirements as outlined in the QAM and SOPs. Follow appropriate channels regarding modification of existing SOPs.
- Maintain accurate records of analyses in notebooks; maintaining instrumentation logbooks.
- Ensure that applicable data are included in each data package in accordance with applicable SOPs.
- Record all nonconformance and corrective actions.
- Follow appropriate protocols when the results for QC samples and/or check standards do not meet acceptance criteria.
- Apply integrity and professional judgment when dealing with analytical processes and laboratory operations.

2.3 Personnel and Training

2.3.1 The ALS laboratory employs sufficient personnel to complete required chemical analyses and support activities. Support activities include personnel recruiting and management, sample receiving and logging, computer programming and data processing, analytical report preparation, equipment procurement, and method development.

2.3.2 Key Personnel - Listed in Exhibit 3

2.3.3 Training

All ALS staff assigned to perform tasks affecting or relating to testing receives training relative to pertinent areas of responsibility, both prior to performing work on client samples and on an ongoing basis. Such training comes from internal and external sources. The ALS training program specified in the ALS SOP LAB-006, “Training” includes quality training, technical training, safety training, and other training as described in this QAM. ALS managers are responsible to ensure that all staff training is initiated, completed, verified, and documented.

The specific training and experience of laboratory personnel is documented in individual training files maintained in accordance with ALS SOP LAB-007, “Record of Training,” and include documentation of analytical proficiency through the analysis of QC and PT samples.

2.3.3.1 Quality Training

The ALS Quality Assurance Manager is responsible to orient new analytical personnel to the ALS QA program, policies, and procedures. This required orientation includes training classes and video presentations, as well as reading and understanding this QAM. Quality orientations are presented on an as-needed basis as new employees are hired. The quality orientation has two goals: to communicate information and to emphasize the importance of maintaining quality in the laboratory.

2.3.3.2 Technical Training

Technical training is accomplished through reading SOPs, using other training materials (manufacturer manuals, videos, and computer-based instruction), observation of others' performance, and performing tests under direct supervision. When possible, training is verified through the successful analysis of QC samples. The appropriate manager evaluates the acceptability of prior experience and training.

As laboratory SOPs are updated, assigned analysts receive notification. They are required to read the revised SOPs and document that reading in their training files before performing analyses using the revised procedure.

Demonstration of Capability – A demonstration of capability is conducted initially and at least annually for all methods. See ALS SOP LAB-006 section 5.6.

2.3.3.3 Safety Training

Managers are responsible for continuous laboratory safety training and ensuring safety awareness in the laboratory. ALS safety documents are tracked as per the document control system (Section 3) and training records are retained as per ALS SOP Lab-007, "Record of Training."

Training to handle and properly dispose of hazardous waste is provided, as appropriate, for each work area.

Monthly meetings of the Safety Committee provide a forum to identify and resolve safety concerns.

Safety is discussed at all laboratory staff meetings.

2.3.3.4 Other Training

The Radiation Safety Officer (RSO) directs training to handle radiological materials . All analysts must complete this training satisfactorily before working with radiological materials and samples.

Training concerning the use of the computer system and automated data handling systems is conducted by both the appropriate managers and computer support personnel.

Management training is conducted by ALS staff or by outside consultants.

3.0 Document Control

3.1 General

3.1.1 Control of Internally Generated Documents

SOPs and the QAM are maintained under document control procedures described in ALS SOP LAB-021 – “Document Control.” Additional information concerning the generation and updating of controlled documents is contained in section 3.2 and 3.3 of this QAM and ALS SOPs, IH-GL-004, XX-DC-011, MC-QA-001, and DS-QA-001.

3.1.2 Control of Externally Generated Documents

External documents, such as reference methods, accreditation policies and requirements, and reference manuals are maintained under document control policies through the use of ALS On-Line and described in ALS SOP LAB-021. Additionally, quality assurance program documents, project plan documents, and contractual Statement of Work documents generated by a client can be designated as controlled documents at the discretion of the ALS Project Manager, the ALS Quality Assurance Manager, or the Laboratory Director.

3.1.3 Documentation

The distribution of internal controlled documents is managed by the Quality Assurance personnel using databases and ALS On-Line. Documentation of internally generated documents for employee assignment and reading are maintained by Quality Assurance.

A record of the distribution of controlled documents is maintained by the Quality Assurance Personnel. This record includes the document and version numbers, assigned personnel, and reading records.

3.2 QAM

This QAM is a controlled document with distribution to all ALS staff members involved in QAM related activities. The ALS Quality Assurance Manager may distribute copies of the ALS QAM to other persons, such as clients and subcontractors. The QAM is updated annually.

3.3 SOPs

3.3.1 Retention and Distribution

The Quality Assurance Manager is responsible for the retention and distribution of SOPs, in accordance with ALS SOP LAB-021, “Document Control.”

3.3.2 Revision of SOPs

Revisions are made in accordance with ALS SOP LAB-021 and the following table. Assignments are made to the responsible ALS manager or designee to review and update SOPs applicable to the area of responsibility. At times it is also necessary to obtain approval by specific clients before written SOPs can be modified. After revision, the appropriate Manager, Quality Assurance Manager, and Laboratory Director must approve the updated SOP. Updated SOPs are then distributed on line and to holders of controlled copies.

SOP Type	Review Cycle
Environmental Testing SOPs	12 Months
Industrial Hygiene Testing SOPs	24 Months
Management Systems SOPs	36 Months
All other SOPs	24 Month

3.3.3 Retiring of SOPs

If it becomes necessary to retire an SOP, approval of the Laboratory Director, appropriate Manager, or Quality Assurance Manager must be obtained before retirement can take place. After retirement, the SOP is stored in the retired SOP file for future reference.

4.0 Facilities

4.1 General

The ALS facility, constructed in 1988 and located at 960 West LeVoy Drive, was designed and built to function as a laboratory. The area used for chemical analyses and associated activities is approximately 25,000 square feet. It is a secure facility with electronically coded card key access for employees; visitors access the facility through a reception area. The floor plan of the ALS building is included in Exhibit 5.

4.1.1 Laboratory Areas

Laboratory areas are segregated by HVAC systems to contain contamination and to eliminate potential contamination from specific laboratory areas that require low ambient chemical background levels for successful analysis. The facility is cleaned and maintained to ensure that contamination is minimized and that laboratory systems perform reliably.

4.1.2 Bench Space

Each area in the laboratory has adequate bench space for instrumentation and for the processes assigned to that area. Frequently, samples are placed on carts to allow efficient processing from preparation through analysis and into storage.

4.1.3 Storage Space

In addition to the bulk storage areas, each laboratory area has cabinet and under-bench storage. Some areas have walk-in storage as well.

4.1.4 Lighting

Each laboratory area was built with lighting designed for analytical work. The lighting has been upgraded to achieve more energy efficiency. Emergency lighting is provided in the event of a power failure.

4.1.5 Air-handling Systems

Laboratory ventilation is provided by single-pass airflow to the individual laboratories. The sample preparation and extraction laboratories are maintained at a negative pressure relative to the rest of the building. Air intakes and exhausts are positioned to reduce cross-contamination by taking advantage of the prevailing winds.

4.1.6 Laboratory Reagent Water System

Laboratory reagent water is prepared and maintained in a reservoir using a combination of deionization, reverse osmosis, and UV radiation. It is delivered throughout the laboratory by a constantly circulating system constructed of polyvinyl difluoride piping. The water supplied meets or exceeds the specifications for ASTM Type II water. The conductance of the reagent water system is monitored and maintained continuously to keep the reagent water within ASTM specifications.

4.1.7 Safety Considerations

The safety plan of ALS is described in detail in the document entitled, “Safety Manual and Chemical Hygiene Plan.”

The laboratory is equipped with safety showers and eyewashes. Fume hood face velocities are checked routinely, and maintenance is conducted to ensure correct hood performance.

Safety showers and eyewashes are inspected in accordance with the applicable OSHA requirements.

Fume hoods are performance tested semi-annually using a calibrated anemometer.

All safety inspection records, including support equipment calibration and maintenance, are kept on file electronically for a minimum of five years.

Waste disposal and control are listed on ALS On-Line.

5.0 Equipment

5.1 Specifications

A comprehensive list of instrumentation and support equipment utilized at ALS is included in Exhibit 6. Instrument specifications and the date of purchase are listed. Redundant instruments are maintained for particular analyses. The ALS Equipment List is organized by laboratory area with similar items grouped together.

5.2 Calibration Procedures

All instruments are calibrated or verified before use using reference materials with traceability established. Specific calibration requirements are detailed in the method SOPs and support equipment SOP. Specific environmental testing method requirements are summarized in Exhibit 7 and Appendix C.

5.3 Preventive Maintenance, Schedules, and Documentation

Routine maintenance is performed on laboratory instruments and equipment according to manufacturer recommendations. Maintenance is provided under warranty, through service contracts, and by ALS in-house personnel. The ALS approach to preventive maintenance is described in ALS SOP LAB-002, “Preventive Maintenance for Analytical Instrumentation.” Records of routine maintenance and emergency maintenance are kept with the instruments in maintenance logbooks according to ALS SOP LAB-030, “Documentation – Maintaining Instrument Records, Notebooks, and Logbooks.”

5.4 Calibration of Support Equipment

Laboratory equipment items such as analytical balances, pipettors, and thermometers used in refrigerators and ovens are calibrated against physical standards rather than chemical standards. Laboratory reference weights and thermometers are certified by ISO accredited vendors against NIST-traceable standards. All support equipment is maintained in proper working order and verified daily or prior to use. Support equipment is calibrated or verified as described by the following SOPs:

- LAB-015 “Balances”
- LAB-010 “Refrigerator Units”
- LAB-016 “Calibration Verification of Pipettors”
- LAB-018 “Calibration of Thermometers”
- LAB-034 “Volumetric Verification of Disposable Digestion Vessels”

6.0 Safety Practices

6.1 Radioactive Materials

Some of the samples received at ALS are radioactive or potentially radioactive. These samples are handled in accordance with the ALS radioactive materials license and ALS SOP WA-DC-002, "Acceptance Criteria for Samples Processed Under the Radioactive Materials License."

Potentially radioactive samples are surveyed for external radiation in the sample receiving area and samples are handled in accordance with ALS SOP QS-DC-001 and IH-GL-006.

Radioactive samples are prepared in laboratory areas under the direction of assigned personnel and analyzed in an area of the laboratory under procedures designed to prevent the transfer of radioactivity out of that area. The handling of radioactive samples at ALS is carried out under the direction of the ALS Radiation Safety Officer (RSO).

6.2 Waste Management

Analysts are trained and laboratory waste is managed according to the following SOPs:

- LAB-004, "Hazardous Waste Handling and Disposal"
- LAB-005, "General Laboratory Safety and Chemical Hygiene"
- EA-DC-002, "Processed Sample Storage & Disposal Control"

7.0 Procurement of Supplies and Services

7.1 General

ALS uses vendors which supply the level of quality required to perform testing activities. ALS maintains a relationship with multiple vendors and looks for vendors with comparable certifications or accreditations. Procedures designed to ensure that materials and services purchased meet the quality specifications of ALS are delineated in SOP LAB-008, "Procurement Controls for Purchased Materials and Services."

7.2 Subcontract Laboratories

Laboratories contracted to perform analytical services for ALS must maintain quality programs consistent with the quality requirements of ALS. Before a laboratory performs subcontracted work for ALS, the Quality Assurance Manager must verify the acceptability of the quality program. At a minimum, this effort includes verification of necessary certifications. It can also include an on-site audit.

Procedures and documentation for using sub-contract laboratories are listed in the ALS SOP LAB-023 "Client Communication." All results provided to ALS by a subcontract laboratory are identified clearly in the analytical report to the ALS client. Under no circumstances will ALS PT samples be sent to a subcontract laboratory.

7.3 Supplies

Procurement and receiving services are provided at ALS by administrative personnel. Procurement and receiving quality requirements established by ALS are followed.

All requisitions for purchase are approved by ALS management and specify the quality of material required.

All materials ordered by ALS will be purchased with available documentation of purity, traceability and uncertainty. Internet certificates are not acceptable unless scanned and stored on network drives.

8.0 Sample Acceptance and Management

8.1 Applicability and Scope

ALS policy is to accept all samples provided by the client unless specific safety concerns (i.e. radioactivity and health concerns) are discovered. Samples accepted with documentation and/or quality problems are identified, documented and resolved with the client as described in sample receiving procedures.

Properly reported sample results begin with efficient and accurate introduction of pertinent information into Horizon. This section describes ALS procedures for sample receipt, log-in, tracking through the laboratory, and disposal of residual materials. These procedures ensure the integrity of results by maintaining an unbroken chain-of-custody for each sample from receipt of the sample material to final disposal of any excess or residual product.

For environmental testing, a table denoting recommended types of bottles, as well as use and descriptions of preservatives, is included in Exhibit 8.

8.2 Sample Receipt

Procedures for receiving, processing, and storing samples and for ensuring continuity of the chain-of-custody are detailed in the following ALS SOPs:

- QS-DC-001,“Sample Receipt and Logging”
- IH-GL-006, “Sample Receipt and Logging”
- QS-EP-100, “EPA Sample Receipt and Logging”
- XX-DC-006, “Chain-of-Custody and Laboratory Tracking”
- WA-DC-002, “Acceptance Criteria for Samples Processed Under the Radioactive Materials License”

The ALS Sample Receiving area is isolated from areas of the laboratory where analyses are performed. The area is equipped with ventilation hoods and adequate bench space to ensure that the sample receiving process is safe, efficient, and not a source of cross-contamination in the laboratory.

8.3 Sample Tracking

Sample handling in the laboratory is tracked using a computer-based Laboratory Information Management System (HORIZON) or through the signatures on the hand-carried chain of custody documents. After samples are received by the laboratory, as described above, sample receiving personnel enter the sample information into the LIMS. As samples move throughout the laboratory, a status code is updated automatically by Horizon as explained in ALS SOP XX-DC-006 or ALS SOP IH-GL-007.

When multiple analyses require splitting a sample, the custody documents are copied such that each split can be independently traced to its origin and appropriate entries can be entered into Horizon.

8.4 Sample Storage and Security

Following receipt, samples are stored in accordance with analytical method requirements for storage and preservation. Samples for organic and inorganic analysis are normally stored in a walk in refrigerator or shelf in the sample receipt area. Samples to be analyzed for environmental volatile testing are stored separately from all other samples in a refrigerator. Samples are stored in the receiving area until transferred to an analyst to initiate the analytical process.

To maintain facility security and thus sample security, entrance to the ALS facility can be attained only through coded card key access, except at the main business entrance; this is open only during normal business hours and monitored by a receptionist. All non-employees are required to sign in with the receptionist at the main entrance.

8.5 Chain-of-Custody

In order to ensure that legally defensible data are produced at ALS, chain-of-custody procedures are established and are described in ALS SOP XX-DC-006 or IH-GL-007.

Examples of the ALS Chain-of-Custody Form (CoC) and Analytical Request Form (ARF) are included in Exhibit 9.

9.0 Analytical Procedures

9.1 General

ALS policy is that all SOPs be compliant with the reference method. In the event that several methods are referenced in an SOP, all procedures must be compliant with all referenced methods. All SOPs include a section describing changes and clarifications from the reference method. In the event that an analytical method is modified, the SOP documentation must include a description of the modification, any justification of the method modification which includes, but is not limited to, method performance and recovery data, any other supporting data, and approval from the Technical Managers, Quality Assurance Manager, and Laboratory Director. In the event that an analytical method must be modified or is modified to perform on specific sample matrices, the modification and reason must be stated in the case narrative. All modified methods will be identified on the analytical report.

9.2 Reference Methods

9.2.1 Reference methods for environmental samples are drawn primarily from the current version of Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846), Third Edition. Reference methods for water analysis are taken from Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983 with its updates, and from 40 CFR, Part 136. To a lesser extent, methods referenced in ALS SOPs come from the current EPA CLP Statements of Work, from ASTM guides, and from Standard Methods for the Examination of Water and Waste Water.

9.2.2 Reference Methods for Industrial Hygiene are primarily drawn from OSHA, NIOSH and internally developed methods.

9.2.3 Reference Methods for dietary supplements and microbiology are listed in Appendices A and B respectively.

9.3 Laboratory SOPs

SOPs are written for all environmental testing methods, any modified reference methods for industrial hygiene testing and any in-house developed methods. SOPs may be reference methods that are not modified. All SOPs are reviewed using document control procedures outlined in section 3.0.

9.4 Historical Performance Limits, Reporting Limits

Exhibit 14 lists all analytical methods and preparatory method combinations in which ALS routinely tracks and maintains statistical control limits and reporting limits. The laboratory can perform using limits provided by clients or from referenced sources in the absence of historical data.

10.0 Assuring the Quality of Results

10.1 General

Before samples are analyzed, the analytical system must be in a controlled, reproducible state from which results of known and acceptable quality can be obtained. That state is verified through the use of Quality Control (QC) procedures intended to ensure accuracy, precision, selectivity, sensitivity, freedom from interference, and freedom from contamination. The QC procedures performed at ALS include: calibration and calibration verification; analysis and comparison of resultant data to predetermined control limits for method blanks, laboratory control samples, spiked matrix samples, duplicate matrix samples, and surrogates added to samples; analysis of performance evaluation samples; determination of Reporting Detection Limits; and the tracking and evaluation of precision and accuracy. For specific analytical methods, other QC procedures are implemented as required by the method.

These QC procedures are performed and evaluated on a batch basis. A preparation batch must not exceed 20 field samples that are of a similar matrix type. The samples in a batch are processed together, through each step of the analysis, to ensure that all samples receive consistent and equal treatment. Consequently, results from the batch QC samples, not including field sample QC, are used to evaluate the results for all samples in the batch.

Instrument calibration, method quality control, and data evaluation is described in Exhibit 10 for environmental testing, in analytical SOPs and minimum requirements for industrial hygiene and dietary supplement testing is discussed in SOPs IH-QA-009, IH-QA-010, and DS-QA-002.

All QC parameters set by the applicable ALS SOP or method reference shall not be exceeded without initiation of a NC/CAR (see ALS SOP LAB-020).

10.2 Calibration and Calibration Verification

Instrument calibration is a QC measure taken to verify selectivity and sensitivity. Calibration of instruments at ALS is accomplished through the use of reference materials of the highest quality obtainable. NIST-traceable reference materials are procured and used if they are available. When NIST-traceable reference materials are not available, certified reference materials from government agencies or reliable vendors are used. In all cases, written records are maintained that allow all analytical results to be traced unambiguously to the reference materials used for calibration.

The following SOPs describe the process and record keeping responsibilities of analysts to ensure that all reagent and reference materials are traceable to their sources:

- LAB-003
- LAB-030
- XX-DC-019
- IH-QA-009
- IH-QA-010
- DS-QA-002

In general, analytical instruments are initially calibrated with standard solutions made from the reference materials at levels appropriate for the analysis. This is called the initial calibration (IC). This calibration is verified with a standard solution independently prepared from a different lot of the reference material, preferably from a different vendor. This step is called initial calibration verification or ICV. At specified intervals throughout the analytical sequence, the calibration is re-verified again through the analysis of a calibration check solution, usually the mid-point standard solution. This process is called the continuing calibration verification or CCV. If the IC, the ICV, or any CCV fails criteria in the analytical method, the system is recalibrated or the results are narrated. It is ALS’ intention to only report results generated under acceptable calibration conditions. Specific calibration procedures are found in the SOPs associated with each method of analysis.

Alternative calibration sequences or procedures will be discussed with clients as per section 3.1.4 and 3.1.5 of the ALS SOP LAB-023 “Client Communication.”

Calibration parameters set by the applicable ALS SOP or method reference shall not be exceeded without initiation of a NC/CAR (see ALS SOP LAB-020).

10.3 Analysis of Method Blanks

The method blank (or preparation blank) contains no sample material; it is treated as a sample in every other way. It is analyzed to monitor any contamination to which the analytical batch might have been exposed during analysis. A method blank is analyzed with every analytical batch. An acceptable blank result must be below the reporting limit for environmental testing and below the reporting limits for industrial hygiene and dietary supplement testing.

Criteria set by the applicable ALS SOP or method reference shall not be exceeded without initiation of a NC/CAR (see ALS SOP LAB-020).

10.4 Analysis of Laboratory Control Samples and QC Samples

A control sample (LCS or QC) contains the analyte(s) of interest in known concentration(s) in a laboratory matrix; it is used to monitor accuracy. It measures the success of the analysis in recovering the analyte(s) of interest from a QC matrix.

Soil samples and other solid matrices are analyzed with an LCS made of clean sand spiked with the analyte(s) of interest. Water samples and other liquid matrices are analyzed with a method blank spiked with the analyte(s) of interest.
Industrial hygiene samples are analyzed with an LCS made of sampling media.

The results of the LCS are reported as percent recovery:

$$\% \text{ Recovery} = \frac{X}{K} \times 100$$

Where: X = Measured value and K = Expected value

LCS/QC criteria set by the applicable ALS SOP or method reference shall not be exceeded without initiation of a NC/CAR (See ALS SOP LAB-020).

10.5 Analysis of Spiked Matrix Samples

Matrix QC samples are generally used to determine acceptability of methods chosen on a field sample and are therefore not used to determine batch acceptability. If the analysis of matrix spike is not possible, as with industrial hygiene, dietary supplements or other samples of limited matrix amount, a duplicate LCS or QC should be analyzed in the batch.

A known concentration of the analyte(s) of interest is added to a second representative portion of a field sample to prepare a matrix spike. The matrix spike is used to determine acceptability of the method chosen on a specific field matrix. It measures the success of the analysis in recovering the analyte(s) of interest from the type of field sample matrix in the batch. A matrix spike is analyzed with every analytical batch of environmental samples. The results are reported as percent recovery.

$$\% \text{ Recovery} = \frac{(X_S - X_u)}{K} \text{ x } 100 \text{ Where:}$$

Where X_s = Measured value in the spiked sample, X_u = Measured value in the unspiked sample, and K= Expected value

Laboratory criteria for LCS and QC samples will be used in the absence of client-specified criteria. Failure to meet these criteria will be noted in report, narrative comments, or as per client instructions.

10.6 Analysis of Duplicate Matrix Samples

Matrix QC samples are generally used to determine acceptability of methods chosen on a field sample and are therefore not used to determine batch acceptability. If the analysis of matrix spike is not possible, as with industrial hygiene, dietary supplements or other samples of limited sample amount, a duplicate LCS or QC should be analyzed in the batch.

A duplicate matrix spike sample or duplicate matrix sample is used to monitor the precision (repeatability) of the method chosen on a field sample. If a sufficient amount of the analyte(s) of interest is present in the field sample, a matrix duplicate sample is analyzed directly. If the analyte(s) of interest are not present in a sufficient amount, two additional portions of field sample are spiked with the analyte(s) of interest to ensure that meaningful results are obtained. A pair of duplicate samples (matrix/matrix duplicate or matrix spike/matrix spike duplicate) is analyzed with every analytical batch of environmental samples. The results of the analysis of duplicate samples are reported as relative percent difference (RPD).

$$\text{RPD} = \frac{|X_1 - X_2|}{[(X_1 + X_2)/2]} \text{ x } 100$$

Where: $|X_1 - X_2|$ = The absolute value of the difference between the two sample values, $[(X_1 + X_2)/2]$ = The average of the two sample values

Laboratory criteria for LCS and QC samples will be used in the absence of client-specified criteria. Failure to meet these criteria will be noted in report, narrative comments, or as per client instructions.

10.7 Analysis of Surrogates Added to Samples

Surrogates are compounds similar to the analyte(s) of interest but that are known not to be present in the environment. Examples are fluorinated or deuterated homologues of the organic analyte(s) of interest. When appropriate compounds are available, their use is specified in the analytical method SOP. When surrogates are used, they are added to the calibration solutions and to each field and QC sample in the batch. Surrogate recovery is a measure of the accuracy and selectivity of the method in the sample matrix. Surrogate results are reported as percent recovery.

$$\%\ \text{Recovery} = \frac{X}{K} \text{ x } 100$$

Where: X = Measured value and K = Expected value

Surrogate criteria set by the applicable ALS SOP or method reference on method QC samples shall not be exceeded without initiation of a NC/CAR (See ALS SOP LAB-020). The same criteria will be used for field samples although failure to meet these criteria will be noted in report, narrative comments, or as per client requirements.

10.8 Reporting Limit Verification Samples (RLVS)

RLVS is a control sample that contains the analyte(s) of interest at the stated reporting limit(s) in an applicable QC matrix; it is used to monitor sensitivity and assess uncertainty at the reporting limit. These samples are not used for batch acceptance and should be recovered at ½ the stated reporting limit. The analyst should consider raising reporting limits if systematic failures are apparent.

10.8.1 A RLVS is required with each batch of samples for environmental testing.

10.8.2 A spiked matrix sample at the reporting limits (RLVS) is required on an annual basis for industrial hygiene testing not using matrix prepared standards.

10.8.3 Reporting limits must be at or above the lowest calibration standard.

10.9 Analysis of Performance Evaluation Samples (PT)

Proficiency testing (PT) samples are prepared by an authorized independent organization outside the laboratory. Exhibit 1 lists PE sample performed by ALS. They are received and analyzed at regular intervals to monitor laboratory accuracy. ALS Laboratories sends the PT sample results to the independent organization, where they are evaluated and then forwarded directly from that organization to accreditation bodies as needed. PT samples are introduced into the regular sample stream of the laboratory and analyzed as routine samples by analysts who regularly perform the method. Laboratory personnel follow all instructions provided by the PT provider.

The Laboratory Director, Technical Managers or the Quality Assurance Manager can institute the analysis of additional PT samples or modify the performance evaluation program as appropriate.

The following guidelines are followed by ALS:

- Averaging results is prohibited.
- Only qualified ALS laboratory employees analyze PT samples.
- Results are not discussed with outside entities or other ALS laboratories prior to the deadline for receipt of the results.
- ALS does not subcontract to other laboratories or receive from other laboratories any PT samples.

When a PT sample result is not acceptable a nonconformance is issued to determine and correct any problem(s) leading to the unacceptable result. (See ALS SOP LAB-020)

10.10 Tracking and Evaluation of Accuracy and Precision

When evaluating batch QC the analyst makes a sequence of decisions before reporting sample results regarding calibration, the method blank, LCS, surrogate recovery, matrix spike, and matrix spike duplicate recovery results.

Assessment of the accuracy of an analytical measurement is based upon the analysis of samples of known composition. ALS relies upon the analysis of LCS/QC samples to track accuracy. The percent recovery relative to the expected value is calculated and can be plotted.

Assessment of the precision (repeatability) of an analytical measurement is based upon repeated analysis of equivalent samples of known or unknown composition. ALS relies upon the analysis of pairs of LCS/QC samples, matrix samples (M/MD) or spiked matrix samples (MS/MSD) to assess precision. The range of the pair is expressed as a relative percent difference (RPD).

Control limits for the accuracy and precision charts are calculated assuming a normal (Gaussian) distribution of results. Historical data points are used to calculate mean values, two-standard deviation warning limits, and three-standard deviation control limits. The establishment and updating of control limits is described in ALS SOPs QC-DC-001, and IH-QA-002.

10.11 Trending

In addition to evaluating individual batch QC results against control limits, QC results from successive batches are also evaluated for possible trends. While a trend is not necessarily an out-of-control situation in itself, it can provide an early warning of a condition that can cause the system to go out of control. ALS SOP XX-DC-018, and IH-GL-009 describes in detail the assessment of QC data in the laboratory. The following conditions are trends that initiate action and/or monitoring.

- A series of seven successive points on the same side of the mean
- A series of five successive points going in the same direction
- A cyclical pattern of QC sample results
- Two successive points between warning limits and control limits

ALS relies on analytical staff to identify trends in analytical systems. Quality Assurance can produce control charts as needed to assess trend but this activity by QA is not preventive and is only used to verify trends exist. The occurrence of a trend does not invalidate data that are otherwise in control. However, trends do require attention to determine whether a cause can be assigned to the trend so that appropriate preventive action can be undertaken.

Long term trends in control limits are evaluated yearly by Quality Assurance and Technical Managers. See ALS SOPs QC-DC-001 and IH-QA-002.

11.0 Data Processing and Review

Data reduction, verification, and reporting are accomplished through extensive use of Horizon. Horizon is a commercial automated data handling system that incorporates a relational database with data upload for instruments and additional configuration to produce reports required by ALS clients. It is maintained by the ALS computer support staff and updated as necessary to accommodate new instrumentation and meet diverse client requirements.

11.1 Data Reduction

Data reduction consists of identifying the pertinent set of calibration standards, specifying the type of calibration to use, and calculating analytical results from the calibration equation. The actual calculations are performed by software residing in the analytical instrumentation. Analyst involvement is limited to instrument setup, run sequences and review of data files for upload to Horizon.

11.2 Ensuring Accuracy of Calculations and Transcriptions

All of the software used for data reduction, verification, and reporting is documented and validated by the ALS computer support staff according to ALS SOPs LAB-101, “Computer Program Testing,” and LAB-102, “Computer Program Documentation,” or by the vendor from whom it is purchased. ALS software is controlled and secured according to ALS SOPs LAB-103, “Computer Software Control,” and LAB-104, “Computer Software Security.” A continuing effort is made at ALS to increase the use of automated data handling, improve efficiency, and minimize human error.

11.3 Peer Review

ALS relies upon a system of peer review to ensure the quality of analytical reports. Peer review procedures are specified in the ALS SOP XX-DC-023 and IH-GL-009. An analyst, familiar with the analytical method used to produce the results (peer reviewer), reviews each report. The peer reviewer verifies that the calibration standards, type of calibration, and sample set with associated QC samples were selected correctly. The peer reviewer also verifies any manual transcriptions and calculations. The applicable Technical Manager can perform additional technical review.

11.4 Verification of Quality Control

The analyst is responsible to evaluate the QC results (method blank, surrogate recovery, LCS, matrix spike, and duplicate results) and to take any necessary actions. Examples of necessary actions are:

- Reporting sample results with the correct qualifier
- Noting unusual situations in the case narrative or report comments
- Initiating nonconformance when required

The peer reviewer is responsible to verify that QC results have been evaluated correctly and that necessary actions have been taken. Peer review procedures are specified in ALS SOP XX-DC-023 and IH-GL-009. The peer reviewer works with the analyst to correct issues raised during the peer review process. The peer review is considered complete when all issues raised by the peer reviewer have been resolved. Resolving issues raised by a peer reviewer can involve the Technical Manager or Quality Assurance Manager.

11.5 Reporting

When the peer review has been completed, a report is generated. In most situations the report is produced from Horizon. In some cases part or all of the report can be produced from the data system of the analytical instrument. The reports produced by ALS meet the following requirements:

- The report identifies the method used. If the method is modified, it is noted as “modified” in the report.
- Any abnormal sample conditions, deviation from hold time, irregularities in preservation or other situations that might affect the analytical results are noted in the report and associated with the analytical results.
- The contents of the report include:
  - ✓ The report title with the name, address, and telephone number of the laboratory
  - ✓ The name of the client or project and the client identification number
  - ✓ Sample description and laboratory identification number
  - ✓ The dates of sample collection, sample receipt, sample preparation, and analysis
  - ✓ The time of sample preparation and/or analysis if the required hold time for either activity is 48 hours or less
  - ✓ A method identifier for each method, including methods for preparation steps
  - ✓ The MDL or minimum reporting limit for the analytical results
  - ✓ The analytical results with qualifiers as required
  - ✓ A description of any quality control failures and deviations from the accepted method
  - ✓ The signature and title of the individual(s) who accept responsibility for the content of the report
  - ✓ The date the report is issued
  - ✓ Clear identification of any results generated by a subcontract laboratory
  - ✓ Page numbers and total number of pages

The Project Manager can review final reports for compliance with client requirements. The Quality Assurance Manager periodically reviews a representative selection of reports for compliance with this QAM. Standard ALS deliverables are produced in accordance with ALS SOPs XX-DC-020 and IH-GL-009.

12.0 Nonconformance and Corrective Action

12.1 General

ALS Laboratory operations are governed by documented procedures, requirements, quality assurance plans, project plans, and contracts. When any operation, for any reason, does not conform to the requirements of the governing documents, the aberrant event, item, or situation must be properly documented and evaluated. In addition, appropriate corrective action must be initiated.

Procedures for the documentation and resolution of nonconformance and corrective action are detailed in the ALS SOP LAB-020 “Nonconformance/Corrective Action Procedures.” It is the policy of ALS that any nonconformance or corrective action which impacts results of testing must include notification to clients.

12.2 Nonconformance

An item, event, or procedure is considered to be nonconforming when it is compared to the governing documents or criteria and found to be unacceptable. Corrective action is required if the event may reoccur or is considered non-compliant with ALS policy and/or procedure.

12.3 Corrective Action

A corrective action used to eliminate systematic and reoccurring events. Corrective actions include a determination of cause, selection of appropriate corrective actions, and monitoring to ensure effectiveness.

12.4 Root Cause

Root cause is a process to determine the cause of an error. Proper root cause analysis is the key to a successful process and sometimes the most difficult part in the corrective action procedure. Often the root cause is not obvious and thus a careful analysis of all potential causes of the problem is required. The root cause process followed must reflect the severity of the problem identified.

12.5 Documentation

All non-conformances and corrective actions require written documentation of events, root cause immediate and permanent corrective actions. When corrective actions are applied there must be monitoring for effectiveness.

13.0 Improvement and Preventive Action

13.1 General

At ALS, improvement of the quality systems and preventive action is effected through an ongoing systems review by management using input from all staff.

ALS actively seeks employee and client input for improvements through surveys and questionnaires. Internally ALS maintains a process improvement website for employees to provide suggestions for improvements. For clients, ALS provides surveys and feedback forms on services provided. These automated systems report directly to the Laboratory Director for input into the management review process.

Preventive actions using quality control data and control charts to trend data are the cornerstone of the preventive action system. Email on a daily basis identifies trends in quality control samples. Trend analysis using control charts can be forwarded to operations personnel for actions but in the long run are obvious to experienced analysts in the normal course of testing activities. Records of activities are maintained in the normal course of laboratory records.

Preventive actions also include preventive instrument maintenance as listed in ALS SOP LAB-002, “Preventative Maintenance for Analytical Instruments.” These actions are documented in run logbooks and maintenance logbooks in accordance with ALS SOP LAB-030, “Documentation: Maintenance of Records, Notebooks, and Logbooks.”

13.2 Internal Audits

Internal audits are conducted in accordance with ALS SOP LAB-027, “Internal Audits.” When internal and external audits or data assessments reveal a cause for concern with the quality of the data an investigation is initiated by quality assurance personnel to determine the extent of the problem. Internal audits do include examination of laboratory practice, the use of data handling systems, documentation and document control, personnel qualification and training records, procurement activities, and other systems that support and augment the laboratory analytical function. All audit findings require corrective action and for any event that casts doubt on the validity of the testing results, client notification within two weeks.

14.0 Records Management

14.1 General

ALS maintains records in accordance with ALS SOP LAB-013, “Archives.” ALS personnel are responsible for the retention, retrieval, and disposition of final records of laboratory data and activities. This includes: data packages, once they are completed; analyst laboratory notebooks and instrument maintenance logs, once submitted for archival; and training records, as established by SOP.

14.2 Data Packages

All documentation which pertains to the analysis of a sample or group of samples that are being reported together must be compiled as a data package. SOPs addressing the preparation and control of data packages include: LAB-013, LAB-030, XX-DC-020, XX-EP-900 and IH-GL-009.

Records or copies of records that relate to the analysis of field samples are compiled into data packages by the analyst. These data packages are generally stored electronically as per ALS SOP LAB-013. Unless specified by contract, applicable statute, or program, data packages are retained for five years.

14.3 Laboratory Notebooks and Logbooks

Laboratory notebooks and logbooks are retained by ALS for ten years and are not released to clients. Laboratory notebooks are assigned to specific analysts, who are responsible for their maintenance. If corrections are required, a single-line cross-out, initials and date are entered.

14.4 Quality Assurance Records

Quality control sample results data are retained for five years. Records of internal audits, nonconformance reports, and corrective action reports are retained for ten years. All records are stored electronically for an indefinite period.

The Quality Assurance Manager is responsible for maintaining and retrieving all records of audits, proficiency testing results, demonstration of competency, nonconformance and corrective action records and reports.

14.5 Client-Related Information

Project Managers are responsible for maintaining, archiving, and retrieving all contracts, project requirements and QAPPs provided to ALS by clients and related to projects completed by ALS. They are also responsible for the destruction of materials provided on unsuccessful proposals and bidding opportunities. Specific procedures for client communication and required documentation are listed in the ALS SOP LAB-023, “Client Communication.”

15.0 Traceability

15.1 Reference Standards

Reference standards used by the laboratory are calibrated at determined intervals by outside vendors for the following equipment. These reference standards are maintained under the control of QA personnel and are used for verifying intermediate materials used by the laboratory. Quality Assurance is responsible for maintaining records and schedules of calibration. ALS uses vendors certified to ISO 17025:2005.

- Reference Thermometers
- Reference Weights
- Anemometers
- Stage Micrometers

Intermediate checks used in the laboratory to verify performance of support equipment are routinely verified against traceable reference standards. Records of such verifications are retained by Quality Assurance.

15.2 Reference Materials

Reference materials used at ALS must be of the grade or quality specified by the pertinent analytical procedure or methodology.

Purchased reference materials must be traceable to a National Metrology Institute (NMI) similar to NIST or equivalent national or international standards where possible.

15.3 Reagents, Solvents, Acids and Other Chemicals

ACS reagent-grade chemicals and solvents are used unless otherwise specified in the analytical method or SOP.

15.4 Documentation

All materials ordered by ALS will be purchased with available documentation of purity, traceability and uncertainty. Internet certificates are not acceptable unless scanned and stored on network drives.

Documentation of reference materials is maintained in accordance with the following ALS SOPs:

- LAB-003 “Labeling of Solutions and Reagents”
- LAB-030 “Documentation – Electronic and Hardcopy Instrument Records, Notebooks, Logbooks, and Raw Data”
- XX-DC-019 “Standards Purity, Preparation, Traceability and Verification”

16.0 Uncertainty

16.1 Uncertainty is associated with most of the results obtained in the laboratory testing conducted by ALS. It is meaningful to estimate the extent of the uncertainty associated with each result generated by the laboratory. It is also useful to recognize that this measurement of uncertainty is likely to be much less than that associated with sample collection activities.

16.2 In practice, the uncertainty of a result may arise from many possible sources. ALS has considered the relative contribution of major sources of error. The approach to estimating uncertainty adopted by the laboratory resulted in the conclusion that many sources of error are insignificant compared to the processes of sample preparation, calibration, and instrumental measurement. The uncertainty associated with the processes can be estimated from quality control data. Accordingly, ALS estimates uncertainty from data derived from quality control samples carried through the entire analytical process. A description of the uncertainty calculation is presented in ALS SOP LAB-022, “Estimation of Uncertainty Measurements.”.” The estimation of uncertainty applied by ALS relates only to measurements conducted in the laboratory. Uncertainty associated with processes conducted external to the laboratory (e.g., sampling activities) is not considered.

16.3 Calculation of uncertainty may use the precision measurement values for duplicate samples when LCS or QC samples are not used in testing.

16.4 The calculation of uncertainty is not required for qualitative tests. The calculation of uncertainty has limited value when specific empirical values are not available.

17.0 Appendices and Exhibits

The appendices and exhibits are available upon request. All current documents are available on ALS On-Line. The documents listed in this section are dynamic; accordingly they can change without notice or revision to this QAM.

Appendix A – Specific Dietary Supplement Testing Requirements
Appendix B – Specific Microbiology Testing Requirements
Appendix C – DoD QSM Special Requirements
Appendix D – Reserved for future use

Exhibit 1 – Certifications
Exhibit 2 – Organization Chart
Exhibit 3 – Key Personnel
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Exhibit 5 – Floor Plan
Exhibit 6 – Instruments and Support Equipment
Exhibit 7 – Environmental Testing Calibration and Corrective Actions and Troubleshooting
Exhibit 8 – Environmental Testing Preservatives and Holding Times
Exhibit 9 – Chain of Custody and Analytical Request Form
Exhibit 10 – Environmental Testing Method QC Evaluations
Exhibit 11 – Master List of Controlled Documents
Exhibit 12 – Terms and Definitions
Exhibit 13 – Control Limits, Reporting Limits and Detection Limits
Exhibit 14 – List of Tests and DoD QSM Accredited Tests

A2. Columbia Analytical Services Quality Assurance Manual

QUALITY ASSURANCE MANUAL

Columbia Analytical Services, Inc.

2655 Park Center Drive, Suite A
Simi Valley, CA 93065
(805) 526-7161
Effective Date: September 1, 2011

Approved by:

Laboratory Director:	Kelly M Horiuchi Kelly Horiuchi	08/17/11 Date
Quality Assurance Program Manager:	Chaney Humphrey Chaney Humphrey	8/17/11 Date
Technical Manager – (VOA GC/MS - Air):	Chris Parnell Chris Parnell	8/15/11 Date
Team Leader – (VOA GC/MS - Air):	Wida Ang Wida Ang	8/12/11 Date
Technical Director – (VOA GC - Air):	Wade Henton	8/12/11 Date
Technical Director – (WET/Gen):	Sue Anderson Sue Anderson	8/12/11 Date
Technical Director – (SVOA / IH):	Madeleine Dangazyan Madeleine Dangazyan	8/12/11 Date

DOCUMENT CONTROL

NUMBER: Non-Controlled

Initials: _______ Date: _____________

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2.0 INTRODUCTION AND COMPANY QUALITY ASSURANCE POLICY

Columbia Analytical Services, Inc. (CAS) is an employee-owned professional analytical services laboratory which performs chemical and microbiological analyses on a wide variety of sample matrices, including drinking water, groundwater, surface water, wastewater, soil, sludge, sediment, tissue, industrial and hazardous waste, air, and other material. Columbia Analytical operates a network of laboratory facilities located in Arizona, California, Florida, New York, Texas, and Washington.

We recognize that quality assurance requires a commitment to quality by everyone in the organization - individually, within each operating unit, and throughout the entire laboratory. Laboratory management is committed to ensuring the effectiveness of its quality systems and to ensure that all tests are carried out in accordance to customer requirements. Key elements of this commitment are set forth in the Columbia Analytical Services, Inc. Quality and Ethics Policy Statement, September 2010 (Appendix A) and in this Quality Assurance Manual (QAM). Columbia Analytical Services, Inc. is committed to operate in accordance with these requirements and those of regulatory agencies, accrediting authorities, and certifying organizations.

Quality Management Systems are established, implemented and maintained by management. Policies and procedures are established in order to meet requirements of accreditation bodies and applicable programs, such as the Department of Defense (DOD) Environmental Laboratory Accreditation Program, as well as client's quality objectives. Systems are designed so that there will be sufficient Quality Assurance (QA) activities conducted in the laboratory to ensure that all analytical data generated and processed will be scientifically sound, legally defensible, of known and documented quality, and will accurately reflect the material being tested. Quality Systems are applicable to all fields of testing in which the laboratory is involved.

Quality Control (QC) procedures are used to continually assess performance of the laboratory and quality systems. Columbia Analytical maintains control of analytical results by adhering to written standard operating procedures (SOPs), using analytical control parameters with all analyses, and by observing sample custody requirements. All analytical results are calculated and reported in units consistent with project specifications to allow comparability of data.

This QAM is applicable to the facility listed on the title page and the off-site extraction facility located at 2360 Shasta Way, Unit G, Simi Valley California. The information in this QAM has been organized according to requirements found in the National Environmental Laboratory Accreditation Program (NELAP) Quality Systems Standards (2003 and 2009), the EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5, USEPA, 2001; and *General Requirements for the Competence of Testing and Calibration Laboratories*, ISO/IEC 17025:2005.

3.0 PROGRAM DESCRIPTION

The purpose of the QA program at Columbia Analytical is to ensure that our clients are provided with analytical data that is scientifically sound, legally defensible, and of known and documented quality. The concept of Quality Assurance can be extended, and is expressed in the mission statement of Columbia Analytical:

> "The mission of Columbia Analytical Services, Inc. is to provide high quality, cost-effective, and timely professional testing services to our customers. We recognize that our success as a company is based on our ability to maintain customer satisfaction. To do this requires constant attention to customer needs, maintenance of state-of-the-art testing capabilities and successful management of our most important asset - our people - in a way that encourages professional growth, personal development and company commitment."

3.1 Quality Management Systems

In support of this mission, the laboratory has developed a Quality Management System to ensure all products and services meet our client's needs. The system is implemented and maintained by the Quality Assurance Program Manager (QA PM) with corporate oversight by the Chief Quality Officer (CQO). These systems are based upon ISO 17025:2005 standards, upon which fundamental programs (AIHA, NELAC 2003, 2009 and DoD QSM) are based. Implementation and documentation against these standards are communicated in corporate policy statements, this QAM, and SOPs. Actual procedures, actions and documentation are defined in both administrative and technical SOPs. Figure 3-1 shows the relationships of the quality systems and associated documentation. Quality systems include:

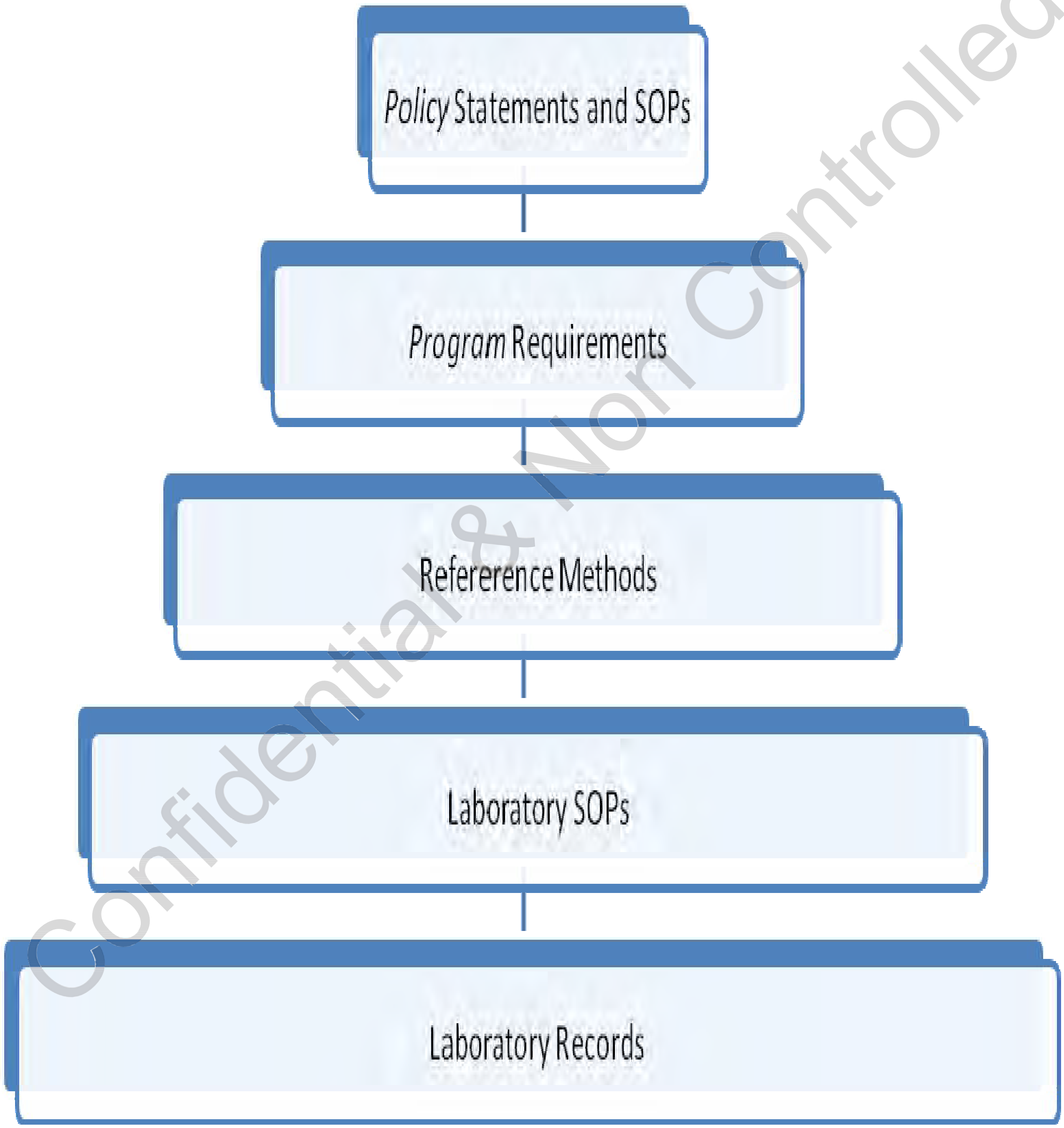
- Standard Operating Procedures
- Sample Management and Chain of Custody procedures
- Statistical Control Charting
- Standards Traceability
- Ethics Training
- Document Control
- Corrective Action Program
- Management Reviews
- Demonstration of Capability

The effectiveness of the quality system is assessed in several ways, including:

- Internal and External Audits covering all aspects of the organization
- Annual Management Reviews
- Analysis of Customer Feedback
- Internal and External Proficiency Testing

Figure 3-1

Relationships of Quality Management Systems and Documentation



3.2 Facilities, Equipment, and Security

Columbia Analytical / Simi maintains approximately 20,000 square feet of laboratory and administrative workspace. The laboratory has been designed and constructed to provide safeguards against cross-contamination of samples and is arranged according to work function, which enhances the efficiency of analytical operations. The ventilation system is designed to meet any needs of analyses performed in the separate work areas. Columbia Analytical minimizes laboratory contamination sources by employing janitorial staff to ensure good housekeeping. In addition, the segregated laboratory areas are designed for safe and efficient handling of a variety of sample types. These specialized areas (and access restrictions) include:

- Sample Management Office; Shipping and Receiving
- Records Archival
- Volatile Organics Laboratory (GC and GC/MS)
- Semi-Volatiles Laboratory (GC, GC/MS and HPLC)
- Ultra Low Level Volatile Organics GC/MS
- General/Wet Chemistry Laboratory
- R&D Laboratory
- Canister Conditioning and Maintenance
- Flow Controller and Critical Orifice Calibration Station
- Sample Storage Walk-in Refrigerator
- Sample, Standards and Media Storage
- Waste Disposal
- Laboratory Deionized Water System
- Laboratory Management, Client Service, Report Generation and Administration
- Information Technology (IT)

The designated areas for sample receiving, refrigerated sample storage, dedicated sample container preparation and shipping provide for the efficient and safe handling of a variety of sample types. Figure 3-2 shows the facility floor plan. The laboratory is equipped with state-of-the-art analytical and administrative support equipment. The equipment and instrumentation are appropriate for the procedures in use. Appendix C lists the major equipment, illustrating the laboratory's overall capabilities and depth.

Columbia Analytical also maintains a satellite extraction facility located at 2360 Shasta Way, Unit G, Simi Valley, California. The approximately 2,000 square foot building contains five fume hoods and is designed with the purpose of performing semi-volatile organics extraction of air, liquid and solid matrices. The extraction facility is equipped with sufficient bench space, glassware washing equipment and materials, flammable solvent storage, sample/extract storage refrigerators and an electric kiln to perform extractions. Refer to Figure 3-3 for the floor plan of the facility.

3.3 Technical Elements of the Quality Assurance Program

The laboratory's technical procedures are based upon procedures published by various agencies or organizations (See Section 17). The Quality Assurance Program provides laboratory organization, procedures, and policies by which the laboratory operates. The necessary certifications and approvals administered by external agencies are maintained by the QA department. This includes method approvals and audit administration. In addition, internal audits are performed to assess compliance with policies and procedures. SOPs are maintained for technical and administrative functions. A document control system is used for SOPs, as well as laboratory notebooks, and this QA Manual. A list of QA Program documents is provided in Appendix A and SOPs in Appendix F.

Acceptable calibration procedures are defined in the SOP for each test procedure. Calibration procedures for other laboratory equipment (balances, thermometers, etc.) are also defined. Quality Control (QC) procedures are used to monitor the testing performed. Each analytical procedure has associated QC requirements to be achieved in order to demonstrate data quality. The use of method detection limit studies, control charting, technical training and preventive maintenance procedures further ensure the quality of data produced. Proficiency Testing (PT) samples are used as an external means of monitoring the quality and proficiency of the laboratory. PT samples are obtained from qualified vendors and are performed on a regular basis. In addition to method proficiency, documentation of analyst training is performed to ensure proficiency and competency of laboratory analysts and technicians. Sample handling and custody procedures are defined in SOPs. Procedures are also in place to monitor the sample storage areas. The technical elements of the QA program are discussed in further detail in later sections of this QA manual.

3.4 Operational Assessments and Service to the Client

The laboratory uses a number of systems to assess its daily operations. In addition to the routine quality control (QC) measurements, the senior laboratory management examines a number of other indicators to assess the overall ability of the laboratory to successfully perform analyses for its clients including; on-time performance, customer complaints, training reports and non-conformity reports. A frequent, routine assessment must also be made of the laboratory's facilities and resources in anticipation of accepting an additional or increased workload.

Columbia Analytical utilizes a number of different methods to ensure that adequate resources are available for service demands. Senior staff meetings, tracking of outstanding proposals and an accurate, current synopsis of incoming work all assist the senior staff in properly allocating sufficient resources. All Requests for Proposal (RFP) documents are reviewed by Project Managers, Business Development and appropriate managerial staff to identify any project specific requirements that differ from the standard practices of the laboratory. Any requirements that cannot be met are noted and communicated to the client, as well as requesting the client to provide any project specific Quality Assurance Project Plans (QAPPs) if available. Status/production meetings are also conducted regularly with the laboratory and project managers to inform the staff of the status of incoming work, future projects, or project requirements.

When a customer requests a modification to an SOP, policy, or standard specification the Project Manager will discuss the proposed deviation with the Laboratory Director and department manager to obtain approval for the deviation. The QA PM may also be involved. All project-specific requirements must be on-file and with the service request upon logging in the samples. The modification or deviation must be documented. A Project-Specific Communication Form, Form V, or similar, may be used to document such deviations.

The laboratory shall afford clients cooperation to clarify the client's request and to monitor the laboratory's performance in relation to the work performed, provided that the laboratory ensures confidentiality to other clients. The laboratory maintains and documents timely communication with the client for the purposes of seeking feedback and clarifying customer requests. Feedback is used and analyzed to improve the quality of services. The *SOP for Handling Customer Feedback* (ADM-FDBK) is in place for these events.

3.5 Document Control and Records

Procedures for control and maintenance of documents are described in the *SOP for Document Control* (ADM-DOC_CTRL). The requirements of the SOP apply to all laboratory logbooks (standards, maintenance, run logbooks, etc), certificates of analysis, SOPs, QAMs, quality assurance project plans (QAPPs), Environmental Health & Safety (EHS) manuals, and other controlled Columbia Analytical documents.

The contents of this manual are reviewed, revised (as needed) and approved for use at least annually by authorized personnel (Quality Assurance Program Manager (QAPM), Laboratory Director and Team Leaders) where the scope of the review ensures that it continuously reflects current policies and practices and incorporates all applicable requirements. Additionally, the date the review was completed is indicated by the date of the last approval signature on the title page.

Each controlled copy of a controlled document will be released only after a document control number is assigned and the recipient is recorded on a document distribution list. Filing and distribution is performed by the Quality Assurance Manager, or designee, and ensure that only the most current version of the document is distributed and in use. A document control number is assigned to logbooks. Completed logbooks that are no longer in use are archived in a master logbook file. Logbook entries are standardized following the *SOP for Making Entries into Logbooks and onto Analytical Records* (ADM-DATANTRY). The entries made into laboratory logbooks are reviewed and approved at a regular interval (quarterly).

A records system is used which ensures all laboratory records (including raw data, reports, and supporting records) are retained and available. The archiving system is described in the *SOP for Data and Record Archiving* (ADM-ARC).

3.6 Subcontracting

Analytical services are subcontracted when the laboratory needs to balance workload or when the requested analyses are not performed by the laboratory. Subcontracting, to capable qualified laboratories is only done with the knowledge and approval of the client. Subcontracting to another Columbia Analytical laboratory is preferred over external-laboratory subcontracting. Established procedures are used to qualify external subcontract laboratories.

These procedures are described in the *SOP for Qualification of Subcontract Laboratories* (ADM-SUBLAB). The Corporate Quality Assurance staff is responsible for maintaining a list of qualified subcontract laboratories.

3.7 Procurement

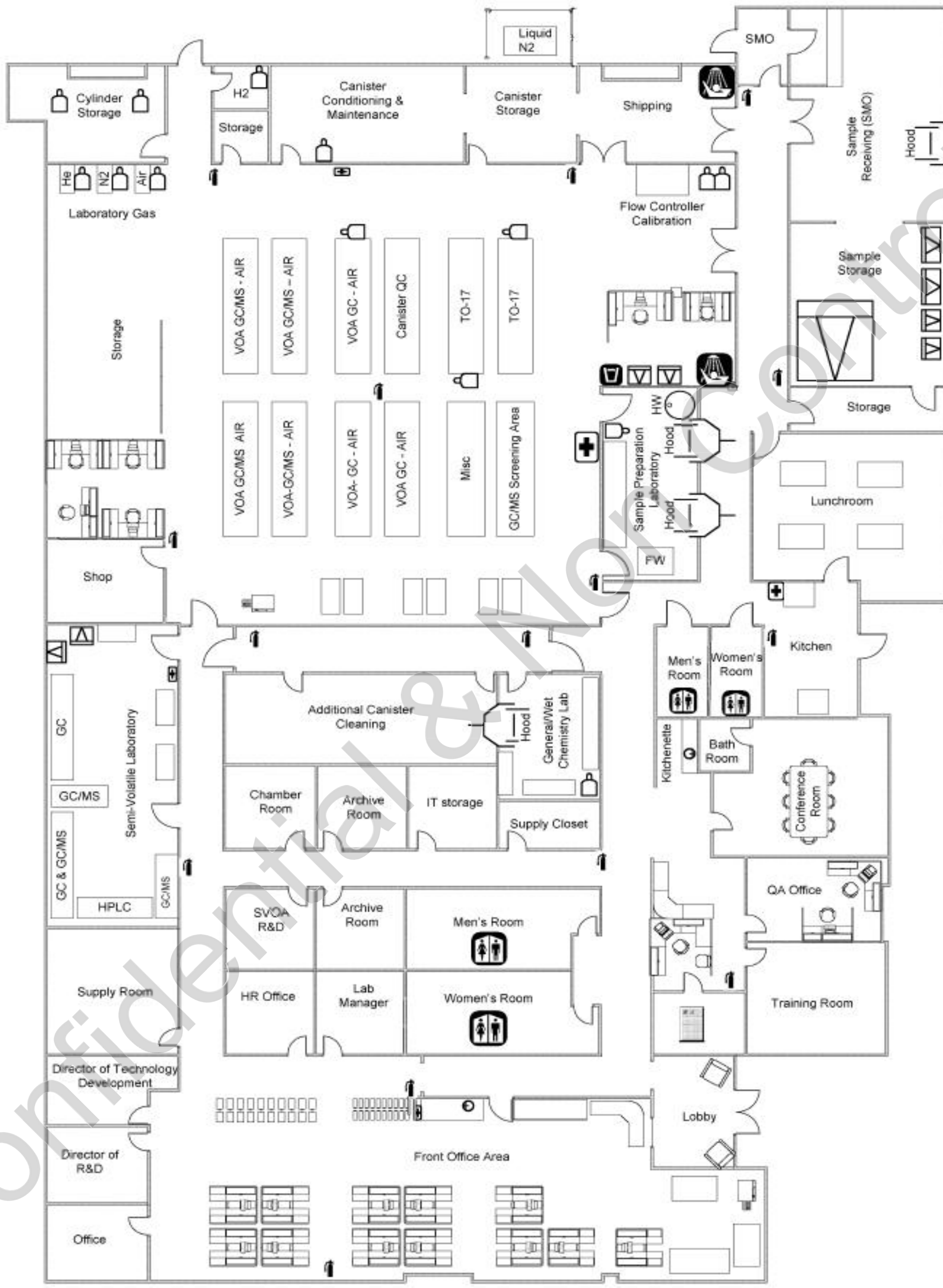
The quality level of reagents and materials (grade, traceability, etc.) required is specified in the analytical SOPs. Department supervisors ensure that the proper materials are purchased. Inspection and verification of material ordered is performed at the time of receipt by receiving personnel. The receiving staff labels the material with the date received. Expiration dates are assigned as appropriate for the material. Storage conditions and expiration dates are specified in the analytical SOP. The corporate Policy for Standards and Reagents Expiration Dates provides default expiration requirements. Supplies and services that are critical in maintaining the quality of laboratory testing are procured from pre-approved vendors. The policy and procedure for purchasing and procurement are described in the *SOP for Purchasing and Approval of Vendors* (ADM-PUR). Also, refer to section 9.6 for a discussion of reference materials.

Receipt procedures include technical review of the purchase order/request to verify that what was received is identical to the item ordered. The laboratory checks new lots of reagents for unacceptable levels of contamination prior to use in sample preservation, sample preparation, and sample analysis by following the *SOP for Checking New Lots of Chemicals for Contamination* (ADM-CTMN).

3.8 Review of Requests, Tenders and Contracts (Procedures for Accepting New Work)

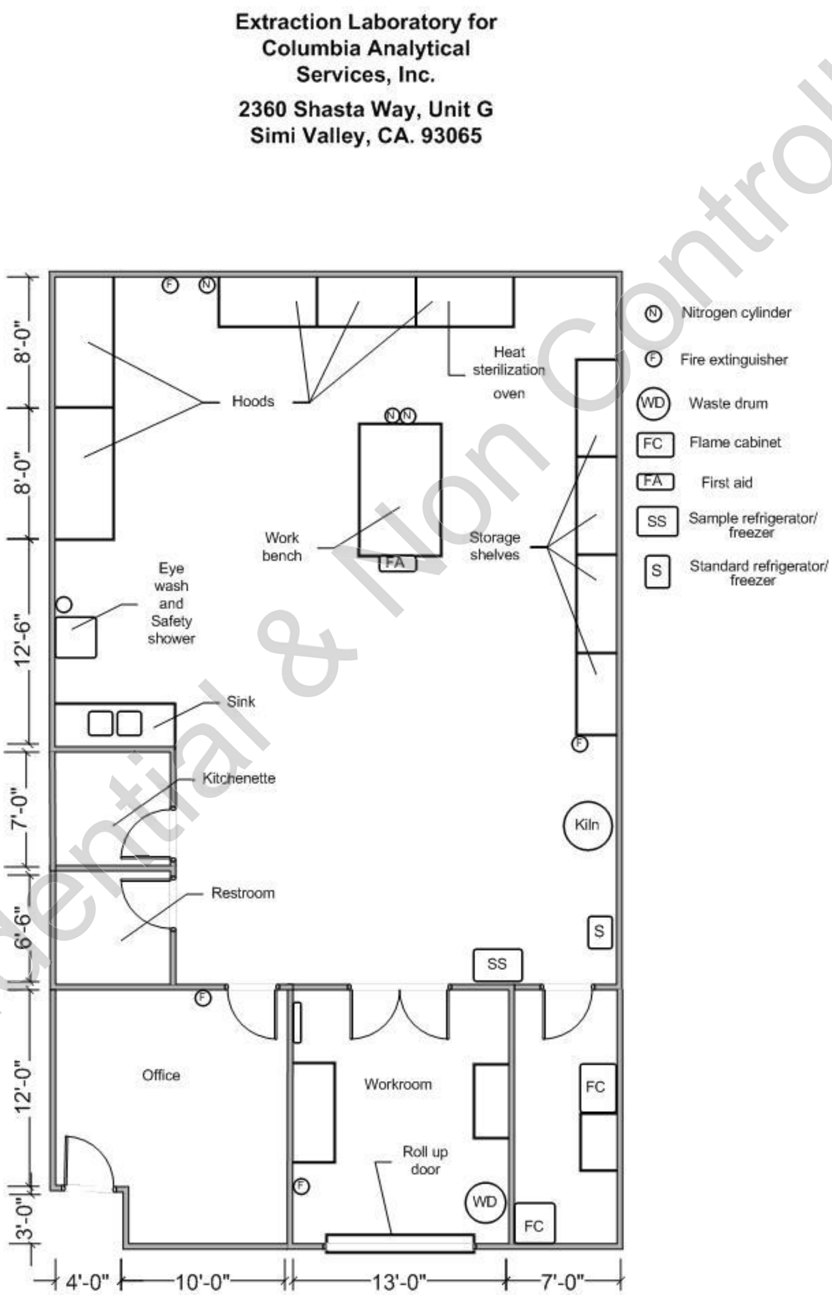
Requests for new work are reviewed prior to signing any contracts or otherwise agreeing to perform the work. The specific methods to be used are agreed upon between the laboratory and the client. A capability review is performed to determine if the laboratory has or needs to obtain certification to perform the work, to determine if the laboratory has the resources (personnel, equipment, materials, capacity, skills, expertise) to perform the work, and if the laboratory is able to meet the client's required reporting and QC limits. The results of this review are communicated to the client and any potential conflict, deficiency, lack of appropriate accreditation status, or concerns of the ability to complete the client's work are resolved. Any differences between the request or tender and the contract shall be resolved before any work commences. The client should be notified at this time if work is expected to be subcontracted. Each contract shall be acceptable both to the laboratory and the client. Records are maintained of pertinent discussions with a client relating to the client's requirements or the results of the work. If a contract needs to be amended after work has commenced, the contract review process is repeated and any amendments are communicated to all affected personnel. Changes in accreditation status affecting ongoing projects must be reported to the client.

Figure 3-2
Columbia Analytical/Simi Laboratory Floor Plan



CAS SIMI VALLEY FLOOR PLAN		
2655 Park Center Drive, Suite A, Simi Valley, California 93065		
-First Aid	HW -Hazardous Waste Cabinet	
-Network Server Room	-Emergency Shower	FW -Flammable Waste Cabinet
-Fire Extinguisher	-Gas Cylinder(s)	
-Refrigerator/Freezer	-Deionized Water	

Figure 3-3
Columbia Analytical/Simi Extraction Laboratory Floor Plan



4.0 PROFESSIONAL CONDUCT, DATA INTEGRITY, AND ETHICS

One of the most important aspects of the success of CAS is the emphasis placed on the integrity of the data provided and the services rendered. This success is reliant on both the professional conduct of all employees within CAS as well as established laboratory practices. All personnel involved with environmental testing and calibration activities must familiarize themselves with the quality documentation and implement the policies and procedures in their work.

4.1 Professional Conduct

To promote quality, CAS requires certain standards of conduct and ethical performance among employees. The following examples of documented CAS policy are representative of these standards, and are not intended to be limiting or all-inclusive:

- Under no circumstances is the willful act of fraudulent manipulation of analytical data condoned. Such acts are to be reported immediately to senior management for appropriate corrective action.
- Unless specifically required in writing by a client, alteration, deviation or omission of written contractual requirements is not permitted. Such changes must be in writing and approved by senior management.
- Falsification of data in any form will not be tolerated. While much analytical data is subject to professional judgment and interpretation, outright falsification, whenever observed or discovered, will be documented, and appropriate remedies and punitive measures will be taken toward those individuals responsible.
- It is the responsibility of all Columbia Analytical employees to safeguard sensitive company information, client data, records, and information; and matters of national security concern should they arise. The nature of our business and the well being of our company and of our clients is dependent upon protecting and maintaining proprietary company/client information. All information, data, and reports (except that in the public domain) collected or assembled on behalf of a client is treated as confidential. Information may not be given to third parties without the consent of the client. Unauthorized release of confidential information about the company or its clients is taken seriously and is subject to formal disciplinary action. All employees sign a confidentiality agreement upon hire to protect the company and client's confidentiality and proprietary rights.

4.2 Prevention and Detection of Improper, Unethical or Illegal Actions

It is the intention of CAS to proactively prevent and/or detect any improper, unethical or illegal action conducted within the laboratory. This is performed by the implementation of a program designed for not only the detection but also prevention. Prevention consists of educating all laboratory personnel of their roles and duties as employees, company policies, inappropriate practices, and their corresponding implications as described here.

In addition to education, appropriate and inappropriate practices are included in SOPs such as manual integration, data review and specific method procedures. Electronic and hardcopy data audits are performed regularly, including periodic audits of chromatographic electronic data. Requirements are described in the Policy for Internal Quality Assurance Audits and details are listed in laboratory administrative SOPs. All aspects of this program are documented and retained on file according to the company policy on record retention.

The CAS Employee Handbook also contains information on the CAS ethics and data integrity program, including mechanisms for reporting and seeking advice on ethical decisions.

4.3 Laboratory Data Integrity and Ethics Training

Each employee receives in-depth (approximately 6-8 hour) core Data Integrity/Ethics Training. New employees are given a QA and Ethics orientation within the first month of hire, followed by the core training within 1 year of hire. On an ongoing basis, all employees receive semi-annual ethics refresher training. Topics covered are documented in writing and all training is documented. It is the responsibility of the QA PM to ensure that the training is conducted as described.

Key topics covered are the organizational mission and its relationship to the critical need for honesty and full disclosure in all analytical reporting, how and when to report data integrity issues and record keeping. Training includes discussion regarding all data integrity procedures, data integrity training documentation, in-depth data monitoring and data integrity procedure documentation.

Data integrity training provides assurance that a highly ethical approach to testing is a key component of all laboratory planning, method implementation, and training. There are four elements to the laboratory's procedures for data integrity. These include:

1) Data integrity training (conducted initially and at least annually);
2) Signed data integrity documentation for all employees;
3) In-depth periodic monitoring of data integrity;
4) Data integrity procedure documentation (*SOP for Ensuring Data Integrity* (ADM-DATA_INT)).

There is specific emphasis on the importance of proper written narration on the part of the analyst with respect to those cases where analytical data may be useful, but are in one sense or another partially deficient. A signature attestation sheet of data integrity training including their understanding of their obligations related to data integrity and as specified in the training is generated for attendees and maintained on file for review. Trainees are required to understand that any infractions of the laboratory data integrity procedures will result in a detailed investigation that could lead to very serious consequences including immediate termination, or civil/criminal prosecution.

The training session includes many concepts and topics, numerous examples of improper actions (defined by DoD as deviations from contract-specified or method-specified analytical practices and may be intentional or unintentional), legal and liability implications (company and personal), causes, prevention, awareness, and reporting mechanisms.

4.4 Management and Employee Commitment

Columbia Analytical makes every attempt to ensure that employees are free from any commercial, financial, or other undue pressures that might affect their quality of work. Related policies are described in the Columbia Analytical Employee Handbook. This includes:

- CAS Open Door Policy (CAS Employee Handbook) – Employees are encouraged to bring any work related problems or concerns to the attention of local management or their Human Resources representative. However, depending on the extent or sensitivity of the concern, employees are encouraged to directly contact any member of upper management.
- CAS Corporate Ethics Point Program – An anonymous and confidential reporting system available to all employees that is used to communicate misconduct and other concerns. The program shall help minimize negative morale, promote a positive work place, and encourage reporting suspected misconduct without retribution. Associated upper management is notified and the investigations are documented.
- Use of flexible work hours. Within reason and as approved by supervisors, employees are allowed flexible work hours in order to help ease schedule pressures which could impact decision-making and work quality.
- Operational and project scheduling assessments are continually made to ensure that project planning is performed and that adequate resources are available during anticipated periods of increased workloads. Procedures for subcontracting work are established, and within the Columbia Analytical laboratory network additional capacity is typically available for subcontracting, if necessary.
- Gifts and Favors (CAS Employee Handbook) – To avoid possible conflict of interest implications, employees do not receive unusual gifts or favors to, nor accept such gifts or favors from, persons outside the Company who are, or may be, in any way concerned with the projects on which the Company is professionally engaged.

All employees are required to sign and adhere to the requirements set forth in the Columbia Analytical *Confidentiality and Conflicts of Interest Employee Agreement* and the Columbia Analytical *Commitment to Excellence in Data Quality* on an annual basis (see Appendix A)

5.0 ORGANIZATION AND RESPONSIBILITIES

The Columbia Analytical/Simi staff, consisting of approximately 42 employees, includes chemists, technicians and support personnel. They represent diverse educational backgrounds, experience, and provide the comprehensive skills that the laboratory requires. As seasonal workload increases, temporary employees may be hired to perform specific tasks.

CAS is committed to providing an environment that encourages excellence. All employees share the responsibility for maintaining and improving the quality of our analytical services. The responsibilities of key personnel within the laboratory are described below. Table 5-1 lists the Columbia Analytical/Simi personnel assigned to these key positions. Managerial staff members are provided the authority and resources needed to perform their duties. An organizational chart of the laboratory, as well as the resumes of key personnel, can be found in Appendix B.

- The role of the **Laboratory Director** is to provide technical, operational, and administrative leadership through planning, allocation and management of personnel and equipment resources. The Laboratory Director provides leadership and support for the QA program and is responsible for overall laboratory efficiency and the financial performance of the Simi Valley facility. The Laboratory Director has the authority to stop work in response to quality problems. The Laboratory Director also provides resources for implementation of the QA program, reviews and approves this QA Manual, reviews and approves standard operating procedures (SOPs), and provides support for business development by identifying and developing new markets through continuing support of the management of existing client activities.

- The responsibility of the **Quality Assurance Program Manager** (QA PM) has the authority and responsibility for implementing, maintaining, and improving the quality system. This includes coordination of QA activities within the laboratory, ensuring that all personnel understand their contributions to the quality system, ensuring communication takes place at all levels within the laboratory regarding the effectiveness of the quality system, evaluating the effectiveness of training; and monitor trends and continually improve the quality system. Audit and surveillance results, control charts, proficiency testing results, data analysis, corrective and preventive actions, customer feedback, and management reviews can all be used to support quality system implementation. The QA PM is responsible for ensuring compliance with NELAC standards (and ISO, DoD QSM, etc. as applicable). The QA PM works with laboratory staff to establish effective quality control and assessment plans and has the authority to stop work in response to quality problems. The QA PM is responsible for maintaining the QA Manual and performing an annual review of it; reviewing and approving SOPs and ensuring the annual review of technical SOPs; maintaining QA records such as metrological records, archived logbooks, PT results, etc.; document control; conducting PT sample studies; approving nonconformity and corrective action reports; maintaining the laboratory's certifications and approvals; and performing internal QA audits. The QA PM reports directly to the Laboratory Director and also works closely with the Chief Quality Officer. It is important to note that when evaluating data, the QA PM does so in an objective manner and free of outside, or managerial, influence.

- The Chief Quality Officer (CQO) is responsible for the overall QA program at all the Columbia Analytical laboratories. The CQO is responsible for oversight of QA PMs regulatory compliance efforts (NELAC, ISO, DoD, etc). The CQO performs annual internal audits at each laboratory; maintains a database of laboratory certification/accreditation programs; approves company-wide SOPs; maintains a database of approved subcontract laboratories; provides assistance to the laboratory QA staff and laboratory managers; prepares a quarterly QA activity report; etc.

➢ In the case of absence of the Laboratory Director or QA Program Manager, deputies are assigned to act in that role. Default deputies for these positions are a Project Manager or Volatile Organics Technical Manager (for the Laboratory Director) and the CQO or Laboratory Director (for the QA PM).

- The **Environmental Health and Safety Officer** (EH&S) is responsible for the administration of the laboratory health and safety policies. This includes the formulation and implementation of safety policies, the supervision of new-employee safety training, the review of accidents, incidents and prevention plans, the monitoring of hazardous waste disposal and the conducting of departmental safety inspections. The EH&S officer is also designated as the Chemical Hygiene Officer. The EH&S Officer has a dotted-line reporting responsibility to Columbia Analytical's EH&S Director.

- The **Data Validation Coordinator/Reporting Supervisor** is responsible for data review, data package preparation, review and coordination, and preparation of case narratives (based on the information provided by the laboratory).

- The **Project Manager** is a scientist assigned to each client to act as a technical liaison between the client and the laboratory. The Project Manager is responsible for ensuring that the analyses performed by the laboratory meet all project, contract, and regulatory-specific requirements. This entails coordinating with the Columbia Analytical laboratory and administrative staff to ensure that client-specific needs are understood and that the services Columbia Analytical provides are properly executed and satisfy the requirements of the client.

- The Analytical Laboratory is divided into operational units based upon specific disciplines. Each department is responsible for establishing, maintaining and documenting a quality control program based upon the unique requirements within the department. Each **Department Manager and Supervisor** has the responsibility to ensure that quality control functions are carried out as planned, and to guarantee the production of high quality data. Department managers and bench-level supervisors have the responsibility to monitor the day-to-day operations to ensure that productivity and data quality objectives are met. Each department manager has the authority to stop work in response to quality problems in their area. Analysts have the responsibility to carry out testing according to prescribed methods, SOPs, and quality control guidelines particular to the laboratory in which he/she is working.

- The **Sample Management Office** plays a key role in the laboratory QA program by performing and/or assisting in the proper preparation and shipment of sampling media. In addition, personnel are responsible for the verification of sample receipt information, performing sample acceptance and log-in and distribution of documentation per laboratory defined procedures and the initial storage of samples in the proper environment and location and performing proper sample disposal. Responsibilities also include monitoring and recording of critical thermal preservation equipment temperatures and calibration of associated thermometers against NIST traceable thermometers.

- **Information Technology** (IT) staff is responsible for the administration of the Laboratory Information Management System (LIMS) and other necessary support services. Other functions of the IT staff include laboratory network maintenance, IT systems development and implementation, education of analytical staff in the use of scientific software, Electronic Data Deliverable (EDD) generation, and data back-up, archival and integrity operations.

Table 5-1
Summary of Technical Experience and Qualifications

Personnel	Years of Experience	Project Role
Kelly Horiuchi, B.A.	11	Laboratory Director / Project Manager
Chaney Humphrey, B.S.	7	Quality Assurance Program Manager
Robin Gill	31	Data Validation Coordinator / Reporting Supervisor
Sue Anderson, B.S.	21	General (WET) Chemistry Technical Manager / Project Manager
Samantha Henningsen, B.S.	2	Project Manager
Kathleen Aguilera, B.A.	22	Project Manager
Wade Henton, B.S.	25	Volatiles (GC) Team Leader / Technical Manager
Chris Parnell, B.S.	25	Volatiles (GC/MS) Technical Manager
Wida Ang, B.S.,M.S.	26	Volatiles (GC/MS) Team Leader
Madeleine Dangazyan, B.S.	16	Semi-Volatiles / Industrial Hygiene Technical Manager / Team Leader
Manny Zamora	9	Sample Management Team Leader
Jeff Christian, B.S.	32	Chief Operations Officer
Lee Wolf, B.S.	26	Chief Quality Officer/Quality Assurance Director
Jim Carlson, B.S.	25	President/CEO

6.0 INFORMATION MANAGEMENT

The generation, compilation, reporting, and archiving of electronic data is a critical component of laboratory operations. In order to generate data of known and acceptable quality, the quality assurance systems and quality control practices for electronic data systems must be complete and comprehensive and in keeping with the overall quality assurance objectives of the organization. CAS management provides the tools and resources to implement electronic data systems and establishes information technology standards and policies.

6.1 Software Quality Assurance Plan

Columbia Analytical has defined practices for assuring the quality of the computer software used throughout all laboratory operations to generate, compile, report, and store electronic data. These practices are described in the *CAS Software Quality Assurance Plan (SQAP)*. The purpose of the SQAP is to describe the policies and practices for the procurement, configuration management, development, validation and verification, data security, maintenance, and use of computer software. The policies and practices described in the plan apply to purchased computer software as well as to internally developed computer software. Key components of this plan are policies for software validation and control.

6.2 IT Support

The local Columbia Analytical Information Technology (IT) department is established to provide technical support for all computing systems. The IT department staff continually monitors the performance and output of operating systems. The IT department oversees routine system maintenance and data backups to ensure the integrity of all electronic data described in the *SOP for Data Tape Backup, Archiving & Restoration* (ADM-DTAPES). A software inventory is maintained. Additional IT responsibilities are described in the SQAP and the *SOP for Software and Data Quality Assurance* (ADM-SftwreQA).

In addition to the local IT department, Columbia Analytical corporate IT provides support for network-wide systems. Columbia Analytical also has personnel assigned to information management duties such as development and implementation of reporting systems; data acquisition, and Electronic Data Deliverable (EDD) generation.

6.3 Information Management Systems

Columbia Analytical has various systems in place to address specific data management needs. The Columbia Analytical Laboratory Information Management System (LIMS) is used to manage sample information and invoicing. Access is controlled by password. This system defines sample identification, analysis specifications, and provides a means of sample tracking. This system is used during sample login to generate the internal service request.

Included on the service request is a summary of client information, sample identification, required analyses, work instructions, and deliverable requirements. The LIMS is used to track the status of a sample and is important in maintaining internal chain of custody.

Where possible, instrument data acquired locally is immediately moved to a server (Microsoft Windows2003® domain). This provides a reliable, easily maintained, high-volume acquisition and storage system for electronic data files. With password entry, users may access the system from many available computer stations, improving efficiency and flexibility. The server is also used for data reporting, EDD generation, and administrative functions. Access to these systems is controlled by password. A standardized EDI (electronic data interchange) format is used as a reporting platform, providing functionality and flexibility for end users. With a common standardized communication platform, the EDI provides data reporting in a variety of hardcopy and electronic deliverable formats.

6.4 Backup and Security

Columbia Analytical laboratory data is either acquired directly to the centralized acquisition server or acquired locally and then transferred to the server. All data is eventually moved to the centralized data acquisition server for reporting and archiving. Differential backups are performed on all file server information once per day, Sunday through Thursday. Full backups are performed each Friday night. Tapes are physically stored in a locked media cabinet within a locked, temperature controlled computer room, with every other full backup also securely stored offsite.

Access to sample information and data is on a need-to-know basis. Access is restricted to the person's areas of responsibility. Passwords are required on all systems. No direct external, non-Columbia Analytical access is allowed to any of our network systems.

The external e-mail system and Internet access is established via a single gateway to discourage unauthorized entry. Columbia Analytical uses a closed system for company e-mail. Files, such as electronic deliverables, are sent through the external e-mail system only via a trusted agent or comparable service. The external messaging system operates through a single secure gateway. E-mail attachments sent in and out of the gateway are subject to a virus scan. Because the Internet is not regulated, we use a limited access approach to provide a firewall for added security. Virus screening is performed continuously on all network systems with Internet access.

7.0 SAMPLE MANAGEMENT

Standard operating procedures have been established for all aspects of sample management within the laboratory including sample receiving, handling, acceptance, log-in, protection, storage, retention, transportation, and disposal. The procedures include provisions necessary to protect the integrity of the sample (as received) and to protect the interests of the laboratory as well as the client. These procedures ensure that samples are handled properly and that all associated documentation is complete and consistent. The sample handling factors that must be taken into account to ensure accurate, defensible analytical results include but are not limited to:

- Amount of sample taken (sampling)
- Type of container used
- Existence and type of sample preservation
- Holding Time
- Proper custodial documentation
- Sample storage, tracking and/or transfer
- Retention
- Disposal

A record of all procedures to which a sample is subjected while in the possession of the laboratory including acceptance, rejection, login, identification, preservation checks, storage, tracking, and disposal are documented and maintained. In addition, all indirect procedures which support each record of a sample and protects the integrity of a sample is documented and maintained (i.e., refrigerator and freezer temperature checks, thermometer calibrations, etc.).

7.1 Sampling

The quality of analytical results is highly dependent upon the quality of the procedures used to collect, preserve and store samples. Columbia Analytical/Simi does not provide sampling services. The laboratory only provides materials needed for sample collection; therefore, Columbia Analytical/Simi recommends that clients follow sampling guidelines described in the specific reference methods including 40 CFR 136 and/or USEPA SW-846, NIOSH, OSHA, ASTM, CARB and SCAQMD as appropriate.

When transporting samples to the laboratory, the most expedient but lawful route of transport should be utilized. Also, the hazardous potential of the samples needs to be considered when shipping samples via air freight or passenger airlines.

7.2 Preservation

Columbia Analytical/Simi uses sample preservation, container, and holding time recommendations published in a number of referenced documents including, but not limited to USEPA SW 846, USEPA 600/4-79-020, USEPA 600/r-93-100 (inorganic substances), 600/4-91-010, and EPA/625/R-96/010b (air samples) and the US EPA Methods Update Rule effective 4/11/07. The complete citation for each of these and other references can be found in Section 17.0 of this document. The appropriate container, preservation and holding time information are summarized in Table 7-1. Additional information on this is addressed in each corresponding method SOP.

7.3 Shipping of Containers and Samples

Columbia Analytical/Simi provides sample containers to clients via media requests for all matrices (soil, water, air) with the appropriate preservatives (as applicable). These containers include Tedlar bags, Summa canisters, silica-gel tubes, etc. Columbia Analytical/Simi keeps client-specific shipping requirements on file and utilizes all major transportation carriers to guarantee that sample shipping requirements (same-day, overnight, etc.) are met. Columbia Analytical/Simi also provides its own courier service that makes scheduled courier runs in the greater Los Angeles metropolitan area. The procedures for all requirements directed toward media requests follow the requirements detailed in the *SOP for Media Request Fulfillment* (MED-Media_Req).

7.4 Sample Receiving and Acceptance

It is the policy of Columbia Analytical/Simi to check and record the condition of each sample (i.e. pressure, temperature, etc.) delivered to the Sample Management Office (SMO) and received by the Sample Management Custodian or alternates against certain acceptance criteria as documented in the *SOP for Sample Receiving, Acceptance and Log-In* (SMO-SMPL_REC). This policy is available to all sample management personnel for reference. Any samples, which deviate from these outlined areas, will be clearly flagged with the nature and substance of the deviation. Assessment and condition checks utilized by Columbia Analytical/Simi for the acceptance or rejection of samples are based on Table 7-1, applicable Quality Assurance Project Plan (QAPP), permit, program or rule where appropriate. This verification of sample integrity is conducted by the Sample Custodian and may be dependent on the matrix (i.e., temperature, preservation, and headspace) being submitted.

Any abnormalities or departures from specified condition requirements (as described herein) as observed during the initial assessment are recorded. When there is any doubt as to the suitability of a sample for testing, including signs of damage, when a sample does not conform to the description provided, or when the test method required is not specified in sufficient detail the appropriate Project Manager (PM) is notified. The Project Manager is to consult with the client, whenever possible, regarding specific integrity issues documented during sample receipt for further instructions before proceeding and retain a written record of discussion. There may be instances where the client is unavailable, in which case the PM shall document all attempts at contacting the client.

There may be a need to inform the client that a sample(s) is rejected and cannot be accepted for analysis into the laboratory. This situation includes, but is not limited to loss of sample or insufficient amount (subsampling may be performed if it would not cause loss of sample integrity, but the procedure must be indicated with the test results). Subsampling as in the case of air samples is not appropriate.

The procedures for sample documentation, handling acceptance requirements and deviations from the sample acceptance policy are discussed in detail in the *SOP for Sample Receiving, Acceptance and Log-In* (SMO-SMPL_REC). This procedure is also in place to ensure samples are received and properly logged into the laboratory, and that all associated sample documentation, including Chain-of-Custody (COC) records are complete and consistent with the samples received. All associated documentation, including chain of custody forms, memos, transmittal forms, and phone logs, are kept with each project file.

7.5 Sample Log-in

Each sample is logged into the laboratory in such a way as to ensure traceability and cross-reference with regards to the unique laboratory job number, sample identifications and client sample identifications. The laboratory identification is retained throughout the life of the sample in the laboratory. The identification system is designed and operated to ensure that samples cannot be confused physically or in laboratory documentation. Additional information is provided in the *SOP for Sample Receiving, Acceptance and Log-In* (SMO_SMPL_REC).

7.6 Sample Custody

A sample is in someone's "custody" if:

1. It is in one's actual physical possession;
2. It is in one's view, after being in one's physical possession;
3. It is in one's physical possession and then locked up so that no one can tamper with it;
4. It is kept in a secured area, restricted to authorized personnel only.

Chain-of-Custody (COC) records are used to establish the legal custody of samples, showing the continuous possession of samples from sample collection and transportation to final destination at the laboratory. Custody of each sample is maintained from receipt through disposal (internally utilizing LIMS). When environmental samples are shipped to other laboratories for analysis, the sample management office follows formalized procedures for maintaining the chain of custody, which is written in SOPs for Sample Receiving, Acceptance and Login and Laboratory Storage, Analysis and Tracking.

When samples are removed from the fixed lab and transported to the off-site extraction facility for sample preparation, internal chain of custody procedures still apply. When sample preparation is completed, sample extracts are returned to the laboratory.

Laboratory security and access is important in maintaining the integrity of samples received at Columbia Analytical/Simi. Access to the building is limited to the reception area and sample receiving doors, which are manned during business hours and locked at all other times. In addition, the sample storage area within the laboratory is a controlled access area.

The laboratory is equipped with an alarm system which is monitored by a private security firm who provides nighttime and weekend security.

7.7 Sample Storage, Analysis and Tracking

The procedures and requirements for documenting the storage, analysis and tracking as well as maintaining integrity of samples are detailed in the *SOP for Laboratory Storage, Analysis and Tracking* (ADM-LabSAT).

7.8 Sample Retention and Waste Disposal

Upon completion of all analyses, the laboratory samples are retained in accordance with the requirements specified in the method SOPs and the *SOP for Waste Disposal* (DSP-Waste). The samples are disposed according to approved disposal practices or returned to the client (if applicable). All samples are characterized according to hazardous/non-hazardous waste criteria and are segregated accordingly. This evaluation is generally based on results from analyses performed on the sample by Columbia Analytical/Simi or an approved subcontract laboratory. It should be noted that all wastes produced at the laboratory, including the laboratory's own various hazardous waste streams, are treated in accordance with all applicable local, State and Federal laws. Complete documentation is maintained for samples from initial receipt through final disposal. This ensures an accurate record of the samples from "cradle to grave."

7.9 Intra-laboratory / Inter-laboratory Transfer of Samples

When environmental samples are shipped to another laboratory for analysis, samples are properly packed for shipment and preserved if necessary. Sample bottles are wrapped in protective material and placed in a plastic bag (preferably Ziploc®) to avoid any possible cross-contamination of samples during the transportation process. Blue or wet ice is used for temperature preservation, where necessary.

Table 7-1
Sample Preservation and Holding Times for Performed Methods

Determination (Method)	Matrix	Container	Preservation	MAXIMUM HOLDING TIME
Solid / Water Sample Analysis				
Bromide (EPA 9056)	S,W	P, FP, G	Cool, 4°C	28 Days
Chloride (EPA 9056)	S,W	P, FP, G	None Required	28 Days
Fluoride (9056)	S,W	P	Cool, 4°C	28 days
Hydrogen Ion - pH (EPA 9040B/9045C)	S,W	P, FP, G	None Required	Analyze immediately
Nitrate (EPA 9056)	S,W	P, FP, G	Cool, 4°C	48 hours
Nitrite (EPA 9056)	S,W	P, FP, G	Cool, 4°C	48 hours
Orthophosphate (EPA 9056)	S	P,G	Cool, 4°C	48 hours
Chromium VI (EPA 3060A/7196A)	S	P,G	Cool, 4°C	30 days / 7 days after digestion
Chromium VI (EPA 3060A/7199)	S	P,G	Cool, 4°C	30 days / 7 days after digestion
Chromium VI (EPA 7196A)	W	P, FP, G	Cool, 4°C	24 hours
Chromium VI (EPA 7199)	W	P, FP, G	Cool, 4°C; and/or Ammonium Sulfate buffer to pH = 9.0-9.5	24 hours; 28 days when preserved to pH of 9.0-9.5
Formaldehyde, Acetaldehyde (EPA 8315A Procedure 1 Modified)	S,W	Glass w/Teflon-Lined Lid	Cool, 4°C	Aqueous – prep. - 72 hours, analysis – 30 days; Soil – prep. minimum, analysis – 30 days
Orthorhombic Cyclooctasulfur (In-House Method)	Solid Wallboard	Ziploc Bag, G	None Required	-
H2S/Sulfur Emission (In-House Method)	Solid Wallboard	Ziploc Bag, G	None Required	-
Copper Corrosion (In-House Method)	Solid Wallboard	Ziploc Bag, G	None Required	-

* W = Water or Aqueous solution; S = Soil or Sediment; P = Polyethylene, G = Glass, FP = fluoropolymer

Table 7-1 (continued)
Sample Preservation and Holding Times for Performed Methods[a]

Determination (Method)	Matrix	Container	Preservation	MAXIMUM HOLDING TIME	Sample Vol.[d]
Amines (In-House Method)	Air	Treated Alumina Tubes	Sample Receipt-NA; Storage 4°C±2°C	30 days	100L
Ammonia (OSHA ID-188/ID-164)	Air	H_2SO_4 Treated Carbon Bead Tubes	Sample Receipt-NA; Storage 4°C±2°C	14 days	TWA: 24L STEL: 7.5L
BTU by ASTM D 3588 (SULFUR, ASTM D 5504; C1-C6+, EPA TO-3M; FIXED GASES, 3C)	Gaseous Fuels	Tedlar Bag, Mylar Bag, Summa Canister	N/A	Sulfur (Bag – 24 hours; Canister[c] – 7 days) C1-C6+ (Bag – 72 hours; Canister[b] -30 days[c]) 3C (Bag – 72 hours; Canister[b] -30 days[c])	Bags – 500mL; Canisters – ≥1.0L
C_1-C_6+ (Modified EPA TO-3)	Air	Tedlar Bag, Mylar Bag, Summa Canister	N/A	Bag – 72 hours; Canister[b] – 30 days[c]	Bags – 500mL; Canisters – ≥1.0L
Carboxylic Acids (In-House Method)	Air	Treated Silica Gel Tubes	Sample Receipt-NA; Storage 4°C±2°C	30 days until extraction; 14 days for analysis	100L
Chromium VI (Modification of EPA 7196/7199 or CARB SOP MLD039)	Air	HCO_3 Treated Filters	Sample Receipt, 4°C±2°C Storage Freezer	21 days until extraction; 24 hours for analysis	210L
Total Gaseous Non-methane Organics (TGNMO) (EPA 25C)	Air	Tedlar Bag, Mylar Bag, Summa Canister	N/A	Bag – 72 hours; Canister[b] – 30 days[c]	Bags - 500mL; Canisters – ≥1.0L
Fixed Gases (EPA 3C & ASTM D 1946)	Air	Tedlar Bag, Mylar Bag, Summa Canister	N/A	Bag – 72 hours; Canister[b] – 30 days[c]	Bags – 500mL; Canisters – ≥1.0L
Helium & Hydrogen (EPA 3C Modified)	Air	Summa Canister	N/A	Canister[b] – 30 days[c]	Bags – 500mL; Canisters – ≥1.0L
Argon (EPA 3C Modified)	Air	Tedlar Bag, Mylar Bag, Summa Canister	N/A	Bag – 72 hours[c]; Canister[b] – 30 days[c]	Bags – 500mL; Canisters – ≥1.0L
Air-Phase Petroleum Hydrocarbons (MADEP APH)	Air	Summa Canister	N/A	28 days	6.0L

Table 7-1 (continued)
Sample Preservation and Holding Times for Performed Methods[a]

Determination (Method)	Matrix	Container	Preservation	Holding Time	Sample Vol.[d]
Methanol, Acetaldehyde, Methyl Ethyl Ketone, Propionaldehyde (NCASI – DI/MeOH 94.03 / NCASI – DI/HAPS 99.01)	Aqueous -Effluent	Glass w/Teflon Lined Lid	No Headspace; 4°C±2°C; HCl to pH 2-3 (Effluent only)	30 days	(1) 40mL Vial
Organic Vapors / NAPHTHAS (Diesel; etc.) (NIOSH 1550 / OSHA 7)	Air	Charcoal Tube; 3M 3500 or 3520 Badge; Silica Gel Tube w/ plastic caps	Sample Receipt-NA; Storage 4°C±2°C	14 days	Various
Methane, Ethane, Ethene, Propane, Propene (RSK 175)	Aqueous	Glass w/Teflon- Lined Lid	No Headspace; HCl to pH<2; 4°C±2°C	14 days when preserved	(3) 40mL Vials
Carbon Dioxide (RSK 175)	Aqueous	Glass w/Teflon Lined Lid	No Headspace; neutral pH (5-8); 4°C±2°C	N/A[e]	(3) 40mL Vials
Sulfur Compounds (In-House Method)	Aqueous	Glass w/Teflon- Lined Lid	No Headspace; pH>4; 4°C±2°C	Following pH adjustment – 24 hours	(2) 40mL Vials
Sulfur Compounds (ASTM D 5504; SCAQMD 307-91; Modified SCAQMD 307-91)	Air	Tedlar Bag, Fused Silica Lined Stainless Steel Canister	No direct sunlight	Bag – 24 hours; Canister[c] - 7 days	Bags – 500mL; Canisters – ≥1.0L
Methanol, Ethanol, Isopropyl alcohol, Freon, and Methylene Chloride (EPA TO-3 Modified)	Air	Tedlar Bag, Mylar Bag, Summa Canister	N/A	Bag – 72 hours; Canister[b] – 30 days[c]	Bags – 500mL; Canisters – ≥1.0L
Total Petroleum Hydrocarbons (TPHG) (EPA TO-3 Modified)	Air	Tedlar Bag, Mylar Bag, Summa Canister	N/A	Bag – 72 hours; Canister[b] – 30 days[c]	Bags – 500mL; Canisters – ≥1.0L
Pesticides and Polychlorinated Biphenyls (PCBs) (EPA TO-4A & TO-10A)	Air	Glass PUF Cartridge; TO-4A (High Volume); TO-10A (Low Volume)	Sample Receipt, 4°C±2°C; Store sample and extract @ 4°C±2°C	7 days until extraction; extract – 40 days	2 m^3
Formaldehyde & Other Carbonyl Compounds (EPA TO-11A)	Air	DNPH-Coated Silica Gel Cartridge w/ Polypropylene Cap; SKC UME[x] and Bacharach GMD 570 Passive Monitors (formaldehyde only)	Sample Receipt, 4°C±2°C; Laboratory Preservation, 4°C±2°C	14 days until extraction; 30 days for analysis	100 – 150L
Polycyclic Aromatic Hydrocarbons (PAHs) (EPA TO-13A)	Air	Polyurethane Foam (PUF) plugs, XAD Tube, PUF / XAD-2	Sample Receipt, <4°C; Laboratory Preservation, 4°C±2°C	7 days until extraction; 40 days after	130 – 400 m^3

Table 7-1 (continued)
Sample Preservation and Holding Times for Performed Methods[a]

Determination (Method)	Matrix	Container	Preservation	Holding Time	Sample Vol.[d]
Volatile Organic Compounds (EPA TO-14A & TO-15)	Air	Tedlar Bag, Summa Canister (1L, 6L)	N/A	Bag – 72 hours; Canister – 30 days	Bags - 500mL; Canisters – 1.0L / 6.0L
Volatile Organic Compounds (EPA TO-17)	Air	Sorbent Tubes w/Swagelock Caps & PTFE Ferrules	<4°C; organic solvent free environment; Laboratory Storage, 4°C±2°C	30 days	1-4L

Footnotes :

a.	See Section 17.0 for reference information.
b.	Some methods do not specify the utilization of canisters; therefore, there is no required hold time and this will be noted in the case narrative.
c.	Laboratory recommended hold time; therefore, samples analyzed outside this hold time will be noted in the case narrative accordingly.
d.	Sample volumes are the minimum, which should be received by the laboratory; however, canister volumes should match the canister size utilized.
e.	There is no holding time requirement available for CO_2 and laboratory studies are not available indicating the validity of data prior to or following a specified length of time. Therefore, no holding time notation or qualifier will be adhered to results for this compound.

Figure 7-1
Air Chain of Custody Form

Columbia Analytical Services

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Air - Chain of Custody Record & Analytical Service Request

Page _______ of _______

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

CAS Project No.

CAS Contact:

Company Name & Address (Reporting Information)

Project Name

Project Number

Project Manager

P.O. # / Billing Information

Phone

Fax

Email Address for Result Reporting

Sampler (Print & Sign)

Analysis Method

Comments e.g. Actual Preservative or specific instructions

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume	Analysis Method		Comments

Report Tier Levels - please select
Tier I - Results (Default if not specified) ____
Tier II (Results + QC Summaries) ____
Tier III (Results + QC & Calibration Summaries) ____
Tier IV (Data Validation Package) 10% Surcharge ____

EDD required Yes / No
Type: ______________

Project Requirements (MRLs, QAPP)

Reliquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	
Reliquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	Cooler / Blank Temperature ____ °C

Figure 7-2
Soil / Water Chain of Custody Form

Columbia Analytical Services

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Soil / Water - Chain of Custody Record & Analytical Service Request

Page ______ of ______

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

CAS Project No.

CAS Contact:

Company Name & Address (Reporting Information)

Project Name

Project Number

Project Manager

P.O. # / Credit Card / Billing Information

Phone

Fax

Email Address for Result Reporting

Analysis

Comments

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Water	Soil	Solid	Other				Comments

Report Tier Levels - please select
Tier I - Results (Default if not specified) ____
Tier II (Results + QC Summaries) ____
Tier III (Results + QC & Calibration Summaries) ____
Tier IV (Data Validation Package) 10% Surcharge ____

EDD required Yes / No
Type: ______________

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	Cooler / Blank / Ice / No Ice Temperature ______ °C

Figure 7-3

Columbia Analytical Services, Inc.
Sample Acceptance Check Form

Client: ______________________ Work order: ______________
Project: ____
Sample(s) received on: ______________ Date opened: __________ by: __________

Note: This form is used for all samples received by CAS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

#	Question	Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	➢	➢	➢
2	Container(s) **supplied by CAS**?	➢	➢	➢
3	Did **sample containers** arrive in good condition?	➢	➢	➢
4	Were **chain-of-custody** papers used and filled out?	➢	➢	➢
5	Did **sample container labels** and/or tags agree with custody papers?	➢	➢	➢
6	Was **sample volume** received adequate for analysis?	➢	➢	➢
7	Are samples within specified holding times?	➢	➢	➢
8	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	➢	➢	➢
	Cooler Temperature ________ °C Blank Temperature ________ °C			
9	Was a **trip blank** received?	➢	➢	➢
	Trip blank supplied by CAS: Serial # ________ -TB ________			
10	Were **custody seals** on outside of cooler/Box?	➢	➢	➢
	Location of seal(s)? ____________________ Sealing Lid?	➢	➢	➢
	Were signature and date included?	➢	➢	➢
	Were seals intact?	➢	➢	➢
	Were custody seals on outside of sample container?	➢	➢	➢
	Location of seal(s)? ____________________ Sealing Lid?	➢	➢	➢
	Were signature and date included?	➢	➢	➢
	Were seals intact?	➢	➢	➢
11	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	➢	➢	➢
	Is there a client indication that the submitted samples are **pH** preserved?	➢	➢	➢
	Were **<u>VOA vials</u>** checked for presence/absence of air bubbles?	➢	➢	➢
	Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	➢	➢	➢
12	**Tubes:** Are the tubes capped and intact?	➢	➢	➢
	Do they contain moisture?	➢	➢	➢
13	**Badges:** Are the badges properly capped and intact?	➢	➢	➢
	Are dual bed badges separated and individually capped and intact?	➢	➢	➢

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments

Explain any discrepancies: (include lab sample ID numbers): ______________________

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12);
Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

8.0 ANALYTICAL PROCEDURES

Columbia Analytical employs methods and analytical procedures from a variety of external sources. Reference documents include but are not limited to: ASTM, CARB, NCASI, NIOSH, OSHA, SCAQMD, USEPA SW-846, USEPA 600/4-79-020, 600/4-91-010, 600/R-93/100 (inorganic substances), 600/625/R-96/010b (air samples), EPA 40 CFR part 136, and associated Supplements; US EPA Methods Update Rule effective 4/11/07 and *Standard Methods for the Examination of Water and Wastewater* for water and wastewater samples. Complete citations for these references can be found in Section 17.0. Other published procedures, such as state-specific methods, program-specific methods, or in-house methods may be used. Several factors are involved with the selection of analytical methods to be used in the laboratory. These include the method detection limit, the concentration of the analyte being measured, method selectivity, accuracy and precision of the method, the type of sample being analyzed, and the regulatory compliance objectives. The implementation of methods by Columbia Analytical is described in SOPs specific to each method. A list of NELAP-accredited methods is given in Appendix G. Further details are described below.

8.1 Standard Operating Procedures (SOPs) and Laboratory Notebooks

Columbia Analytical maintains SOPs for use in both technical and administrative functions. SOPs are written following standardized format and content requirements as described in the *SOP for Preparation of Standard Operating Procedures* (ADM-SOP). Each SOP is reviewed and approved by a minimum of two managers (the Laboratory Director and/or Department Manager and the Quality Assurance Program Manager). All SOPs undergo a documented annual review to make sure current practices are described. The QA PM maintains a comprehensive list of current SOPs. The document control process ensures that only the most currently prepared version of an SOP is being used. The QA Manual, QAPPs, SOPs, standards preparation logbooks, maintenance logbooks, et al., are controlled documents, unless otherwise noted. The procedures for document control are described in the *SOP for Document Control* (ADM-DOC_CTRL). In addition to SOPs, each laboratory department maintains a current file, accessible to all laboratory staff, of the current methodology used to perform analyses. Laboratory notebook entries are standardized following the guidelines in the *SOP for Making Entries into Logbooks and onto Benchsheets* (ADM-DATANTRY). Entries made into laboratory notebooks are reviewed and approved by the appropriate supervisor at a regular interval.

8.2 Deviation from Standard Operating Procedures

When a customer requests a modification to an SOP (such as a change in reporting limit, addition or deletion of target analyte(s), etc.), the Project Manager handling that project must discuss the proposed deviation with the department manager in charge of the analysis and obtain their approval to accept the project. The Project Manager is responsible for documenting the approved or allowed deviation from the SOP by placing a detailed description of the deviation attached to the quotation or in the project file and also providing an appropriate comment on the service request when the samples are received.

For circumstances when a deviation or departure from company policies or procedures involving any non-technical function is found necessary, approval must be obtained from the appropriate supervisor, manager, the laboratory director, or other level of authority. Frequent departure from policy is not encouraged. However, if frequent departure from any policy is noted, the laboratory director will address the possible need for a change in policy.

8.3 Modified Procedures

Columbia Analytical strives to perform published methods as described in the referenced documents. If there is a material deviation from the published method, the method is cited as a "Modified" method in the analytical report. Modifications to the published methods are listed in the standard operating procedure. Standard operating procedures are available to analysts and are also available to our clients for review, especially those for "Modified" methods. Client approval is obtained for the use of "Modified" methods prior to the performance of the analysis.

8.4 Analytical Batch

The basic unit for analytical quality control is the analytical batch. The definition that Columbia Analytical has adopted for the analytical batch is listed below. The overriding principle for describing an analytical batch is that all the samples in a batch, both field samples and quality control samples are to be handled exactly the same way, and all of the data from each analysis is to be manipulated in exactly the same manner. The <u>minimum</u> requirements of an analytical batch are:

1) The number of (field) samples in a batch is not to exceed 20.
2) All (field) samples in a batch are of the same matrix.
3) The QC samples to be processed with the (field) samples include:
   a) Method Blank (a.k.a. Laboratory Reagent Blank)

      Function: Determination of laboratory contamination

   b) Laboratory Control Sample

      Function: Assessment of method performance

   c) Matrix Spiked (field) Sample (a.k.a. Laboratory Fortified Sample Matrix)*

      Function: Assessment of matrix bias

   d) Duplicate Matrix Spiked (field) Sample or Duplicate (field) Sample (a.k.a. Laboratory Duplicate)*

      Function: Assessment of batch precision

   * A sample identified as a field blank, an equipment blank, or a trip blank is <u>not</u> to be matrix spiked or duplicated.

4) A single lot of reagents is used to process the batch of samples.

5) Each operation within the analysis is performed by a single analyst, technician, chemist, or by a team of analysts/technicians/chemists.
6) Samples are analyzed in a continuous manner over a timeframe not to exceed 24-hours between the start of processing of the first and last sample of the batch.
7) (Field) samples are assigned to batches commencing at the time that sample processing begins. For example: for analysis of metals, sample processing begins when the samples are digested. For analysis of organic constituents, it begins when the samples are extracted.
8) The QC samples are to be analyzed in conjunction with the associated field samples prepared with them. However, for tests which have a separate sample preparation step that defines a batch (digestion, extraction, etc.), the QC samples in the batch do not require analysis each time a field sample within the preparation batch is analyzed (multiple instrument sequences to analyze all field samples in the batch need not include re-analyses of the QC samples).
9) The batch is to be assigned a unique identification number that can be used to correlate the QC samples with the field samples.
10) Batch QC refers to the QC samples that are analyzed in a batch of (field) samples.
11) Project-specific requirements may be exceptions. If project, program, or method requirements are more stringent than these laboratory minimum requirements, then the project, program, or method requirements will take precedence. However, if the project, program, or method requirements are less stringent than these laboratory minimum requirements, these laboratory minimum requirements will take precedence.

    Note: Matrix spiked samples are often not feasible for air matrices. Therefore, the MS shall be used as required by the test method and as specified by the corresponding method SOP.

8.5 Specialized Procedures

Columbia Analytical not only strives to provide results that are scientifically sound, legally defensible, and of known and documented quality; but also strives to provide the best solution to analytical challenges. Procedures using specialized instrumentation and methodology have been developed to improve sensitivity (provide lower detection limits), selectivity (minimize interferences while maintaining sensitivity), and overall data quality for low concentration applications. Examples are specialized GC/MS analyses, and low level organics analyses (including PAHs, pesticides and PCBs).

9.0 CALIBRATION PROCEDURES

All equipment and instruments used at Columbia Analytical are operated, maintained and calibrated according to the manufacturer's guidelines and recommendations, as well as to criteria set forth in the applicable analytical methodology. Operation and calibration are performed by personnel who have been properly trained in these procedures. Documentation of calibration information is maintained in appropriate reference files. Brief descriptions of the calibration procedures for our major laboratory equipment and instruments are described below. Calibration verification is performed according to the applicable analytical methodology. Calibration verification procedures and criteria are listed in laboratory Standard Operating Procedures. Documentation of calibration verification is maintained in appropriate reference files. Records are maintained to provide traceability of reference materials.

Traceability is defined as the property of a measurement result or value of a standard which can be related to stated references through an unbroken chain, each with stated uncertainties and is documented for all material used to perform calibrations. The documentation, a certificate of analysis containing, at a minimum, the manufacturer, address, accreditation number (where applicable), how traceability was achieved, the traceable values, their associated uncertainty, and the unique serial or laboratory identification number of the equipment or standard reference material (SRM) shall serve as initial point in the chain of traceability. The unique serial number or laboratory identification number is used throughout the laboratory to trace equipment and materials back to the original certificate of analysis.

Laboratory support equipment (thermometers, balances, and weights) are verified on an annual basis by a vendor accredited to ISO/IEC 17025:2005 International Standards. All analytical measurements generated at Columbia Analytical are performed using materials and/or processes that are traceable to a reference material. Metrology equipment (analytical balances, thermometers, etc.) is calibrated using reference materials traceable to the National Institute of Standards and Technology (NIST). These primary reference materials are themselves recertified on an annual basis. Vendors used for metrology support are required to verify compliance to International Standards by supplying the laboratory with a copy of their scope of accreditation.

Equipment subjected to overloading or mishandling, or has been shown by verification to be defective, is taken out of service and labeled until repaired. That piece of equipment is placed back in service only after verifying, by calibration, that it performs satisfactorily.

9.1 Temperature Control and Measuring Devices

Temperatures are monitored and recorded for all critical measurement temperature-regulating devices including freezers, refrigerators and ovens. Each piece of equipment is labeled with a unique identifier, the required temperature or range of use according to the needs of the analysis or application. Temperature record books are kept which contain equipment identifier, daily-recorded temperatures (if in use, business days), acceptance criteria and the initials of the laboratory staff member who performed the checks for all temperature-regulating devices in daily use.

A number of thermometers include a temperature range per certain project requirements (complies with Department of Defense Quality Systems Manual for Environmental Laboratories); this range is recorded to document consistent compliance with required temperatures for refrigerators and freezers, where applicable.

All thermometers are identified by a unique identifying number (i.e., serial number), and the calibration of these thermometers is checked annually against a National Institute of Standards and Technology (NIST) certified thermometer. All corresponding correction factors are noted on the device as well as in the thermometer calibration logbook. The NIST calibrated thermometer is recertified by an approved vendor accredited ISO/IEC 17025:2005 International Standard on an annual basis and certificates are retained on file for review. All temperature monitoring is conducted in accordance with the *SOP for Sample Receipt, Acceptance and Log-In* (SMO-SMPL_REC) and thermometer calibration requirements are performed in accordance with the *SOP for Calibration and Use of the Laboratory Support Equipment* (ADM-SupEQ)**.**

9.2 Volumetric Dispensing Devices

The accuracy of pipettes used to make critical-volume measurements is verified on a quarterly basis. Typically, the indicated volume or range (where applicable) of the pipette is checked and both the accuracy and precision verification are performed using the above-mentioned procedure. The calibrations are evaluated against the intended use (volume or range) of the pipette and if the calibration is not approved for the specified volume(s) it is tagged accordingly (i.e. "Do Not Use Below 5uL"). The results for all calibration verifications are recorded and maintained.

Note: Glass microliter syringes including gas-tight syringes are considered in the same manner as Class A glassware and are not held to the calibration/verification requirements as are other volumetric dispensing devices.

9.3 Analytical Balances and Weights

Analytical balances and weights are calibrated / recertified and certificates issued annually by an approved vendor accredited to ISO/IEC 17025:2005 International Standard. The calibration of each balance is checked once each day of use in the expected range, utilizing the calibrated weights. Bound record books are kept which contain the identification of balance (serial number), recorded measurements and the initials of the analyst who performed the check. All certificates for the balances and weights are available for review.

9.4 Pressure/Vacuum Gauges

Columbia Analytical/Simi digital pressure/vacuum gauges are used in a number of critical measurements within the laboratory. The following is a list of the uses for this gauge type.

- Canister cleaning and conditioning
- Measure the vacuum on canisters before they are sent to the client for sampling.
- Measure the initial/final vacuum/pressure of canisters prior to analysis.
- Measure pressure during the preparation of selected standards.

Digital pressure/vacuum gauges are calibrated and certificates issued once per year by an approved metrology organization. All calibrations are performed against standards traceable to the National Institute of Standards and Technology (NIST) or other recognized national metrology institutes. In addition, Columbia Analytical/Simi performs a calibration check for each gauge six months following the calibration date. The laboratory retains all corresponding calibration and verification documentation for review.

9.5 Water Purification Systems

Purified water is utilized for a number of laboratory functions including instrument and method blanks, trip blanks, washes and sample dilutions. The water purification system utilizes three mixed-ion beds four filters, and resistively lights with constant water recirculation. It is designed to produce deionized water of ASTM Type II quality, with 16-18 megohm-cm resistance at 25°C and is checked and recorded daily (prior to and if in use). Maintenance and repair on the system is conducted by an approved service supplier and all records including purification checks/verifications are maintained on file for review. For procedures on additional purification (i.e., boiling and/or purging) and purification checks/verifications, refer to the applicable method standard operating procedures.

9.6 Source and Preparation of Standards and Reference Materials

Consumable reference materials routinely purchased by the laboratories (e.g., analytical standards) are purchased from nationally recognized, reputable vendors. All vendors have fulfilled the requirements for ISO 9001 certification and/or are accredited by A_2LA. Columbia Analytical relies on a primary vendor for the majority of its analytical supplies. Consumable primary stock standards are obtained from certified commercial sources or from sources referenced in a specific method. Supelco, Ultra Scientific, AccuStandard, Chem Services, Inc., Aldrich Chemical Co., Baker, Spex, etc. are examples of the vendors used. Reference material information is recorded in the appropriate logbook(s) and materials are stored under conditions that provide maximum protection against deterioration and contamination. The logbook entry includes such information as an assigned logbook identification code, the source of the material (i.e. vendor identification), solvent (if applicable) and concentration of analyte(s), reference to the certificate of analysis and an assigned expiration date. The date that the standard is received in the laboratory is marked on the container. When the reference material is used for the first time, the date of usage and the initials of the analyst are also recorded on the container.

Stock solutions and calibration standard solutions are prepared fresh as often as necessary according to their stability. All standard solutions are properly labeled as to analyte concentration, solvent, date, preparer, and expiration date; these entries are also recorded in the appropriate notebook(s) following the *SOP for Making Entries into Logbooks and onto Benchsheets* (ADM-DATANTRY). Prior to sample analysis, all calibration reference materials are verified with a second, independent source of the material (see section 10.3.5).

9.7 Instrument Calibration

The laboratory specifies the procedures and documentation for initial instrument calibration and continuing calibration verification in the applicable method standard operating procedures to ensure that data is of known quality and is appropriate for a specific regulation and/or client requirement. The procedural steps for calibration including, frequency, number of points, integration, calculations, acceptance criteria (appropriate to the calibration technique employed), corrective action, associated statistics, and data qualifications are included in applicable methods, method standard operating procedures and/or client project plans. The essential elements that define the procedures and required documentation for initial instrument calibrations are specified below.

- Sufficient raw data records are retained to permit reconstruction of all calibrations.
- If a reference or mandated method does not specify the number of calibration standards, the initial calibration range shall consist of a minimum of 5 contiguous calibration points for organics and a minimum of 3 contiguous calibration points for inorganics. The actual numbers of points utilized is specified in the corresponding method SOP.
- The concentrations should bracket the expected concentration range of samples.
- Initial instrument calibration procedures referenced in test methods (either directly or indirectly) are readily available to the analysts.
- All sample results are quantitated from the initial instrument calibration and are not quantitated from any continuing instrument calibration verification unless otherwise specified by regulation, method or program.
- The initial instrument calibration is verified with a standard obtained from a second manufacturer or lot and traceability to a national standard is maintained, where available.
- The acceptance criteria utilized is appropriate for the calibration technique employed.
- The lowest calibration standard in the initial calibration is at or below the lowest concentration for which quantitative data are to be reported and is referred to at this laboratory as the method reporting limit (MRL). Some programs and/or agencies refer to this limit as the practical quantitation limit (PQL) or Limit of Quantitation (LOQ).
- Any data reported below the MRL or above the highest calibration standard is considered to have an increased quantitative uncertainty and is appropriately qualified in the report.
- The lowest calibration standard is above the limit of detection or method detection limit (MDL).

9.8 Internal and External Calibrations

Internal standard calibration involves the comparison of instrument responses from the target compounds in the sample to the responses of specific standards added to the sample or sample extract prior to injection. The ratio of the peak area of the target compound in the sample or sample extract to the peak area of the internal standard in the sample or sample extract is compared to a similar ratio derived for each calibration standard. The ratio is termed the response factor (RF) or relative response factor (RRF) in some methods.

External standard calibration involves comparison of instrument responses from the sample to the responses from the target compounds in the calibration standards. Sample peak areas are compared to peak areas of the standards. The ratio of the detector responses to the amount (mass) of analyte in the calibration standard is defined as the calibration factor or in some cases it may be referred to as response factor.

9.9 Continuing Calibration Verification

The essential elements that define the procedures and required documentation for continuing instrument calibration verification are specified below.

- When an initial calibration is not performed on the day of analysis, continuing instrument calibration verification is analyzed with each batch.

- Calibration is verified for each reported compound, element or parameter; however, for multi-component analytes such as aroclors or total petroleum hydrocarbons a representative chemical related substance or mixture may be used. The allowance for this exception is dependent on applicable regulatory, method, or client project plans.

- Generally, the instrument calibration verification is performed at the beginning, end and every ten samples of each analytical batch (except, if an internal standard is used, only one verification needs to be performed at the beginning of the analytical batch); whenever it is suspected that the analytical system may be out of calibration; if the time period for calibration or most previous calibration verification has expired; or for analytical systems that contain a specific calibration verification requirement. Specific requirements for the frequency of continuing calibration verification, for a particular method, is specified in the corresponding method standard operating procedure.

10.0 QUALITY CONTROL

A primary focus of Columbia Analytical's QA Program is to ensure the accuracy, precision and comparability of all analytical results. Prior to using a procedure for the analysis on field samples, acceptable method performance is established by performing demonstration of capability analyses. Performance characteristics are established by performing method detection limit studies and assessing accuracy and precision according to the reference method. Columbia Analytical has established Quality Control (QC) objectives for precision and accuracy that are used to determine the acceptability of the data that is generated. These QC limits are either specified in the test methodology or are statistically derived based on the laboratory's historical data. Quality Control objectives are defined below.

10.1 Quality Control Objectives

10.1.1 Demonstration of Capability - A demonstration of capability (DOC) is made prior to using any new test method or when a technician is new to the method. This demonstration is made following regulatory, accreditation, or method specified procedures. In general, this demonstration does not test the performance of the method in real world samples, but in the applicable clean matrix free of target analytes and interferences.

A quality control sample material may be obtained from an outside source or may be prepared in the laboratory. The analyte(s) is (are) diluted in a volume of clean matrix (for analytes which do not lend themselves to spiking, e.g., TSS, the demonstration of capability may be performed using quality control samples). Where specified, the method-required concentration levels are used. Four aliquots are prepared and analyzed according to the test procedure. The mean recovery and standard deviations are calculated and compared to the corresponding acceptance criteria for precision and accuracy in the test method or laboratory-generated acceptance criteria (if there are not established mandatory criteria). All parameters must meet the acceptance criteria. Where spike levels are not specified, actual Laboratory Control Sample results may be used to meet this requirement, provided acceptance criteria are met.

10.1.2 Accuracy - Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating the mean value of results from ongoing analyses of laboratory-fortified blanks, standard reference materials, and standard solutions. In addition, laboratory-fortified (i.e. matrix-spiked) samples are also measured; this indicates the accuracy or bias in the actual sample matrix. Accuracy is expressed as percent recovery (% REC.) of the measured value, relative to the true or expected value. If a measurement process produces results whose mean is not the true or expected value, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination).

Columbia Analytical utilizes several quality control measures to eliminate analytical bias, including systematic analysis of method blanks, laboratory control samples and independent calibration verification standards. Because bias can be positive or negative, and because several types of bias can occur simultaneously, only the net, or total, bias can be evaluated in a measurement.

10.1.3 Precision - Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sampling, sample handling and in laboratory analysis. The American Society of Testing and Materials (ASTM) recognizes two levels of precision: repeatability - the random error associated with measurements made by a single test operator on identical aliquots of test material in a given laboratory, with the same apparatus, under constant operating conditions, and reproducibility - the random error associated with measurements made by different test operators, in different laboratories, using the same method but different equipment to analyze identical samples of test material.

"Within-batch" precision is measured using replicate sample or QC analyses and is expressed as the relative percent difference (RPD) between the measurements. The "batch-to-batch" precision is determined from the variance observed in the analysis of standard solutions or laboratory control samples from multiple analytical batches.

10.1.4 Control Limits - The control limits for accuracy and precision originate from two different sources. For analyses having enough QC data, control limits are calculated at the 99% confidence limits. For analyses not having enough QC data, or where the method is prescriptive, control limits are taken from the method on which the procedure is based. If the method does not have stated control limits, then control limits are assigned method-default or reasonable values. Control limits are updated periodically when new statistical limits are generated for the appropriate surrogate, laboratory control sample, and matrix spike compounds (typically once a year) or when method prescribed limits change. The updated limits are reviewed by the QA PM. The new control limits replace the previous limits and data is assessed using the new values. Current acceptance limits for accuracy and precision are available from the laboratory. For inorganics, the precision limit values listed are for laboratory duplicates. For organics, the precision limit values listed are for duplicate laboratory control samples or duplicate matrix spike analyses.

10.1.5 Representativeness - Representativeness is the degree to which the field sample, being properly preserved, free of contamination, and analyzed within holding time, represents the overall sample site or material. This can be extended to the sample itself, in that representativeness is the degree to which the subsample that is analyzed represents the entire field sample submitted for analysis. Columbia Analytical has sample handling procedures to ensure that the sample used for analysis is representative of the entire sample. Further, analytical SOPs specify appropriate sample handling and sample sizes to further ensure the sample aliquot that is analyzed is representative in entire sample. Air samples received by the laboratory in canisters and bags are considered to be homogenous and therefore, no special sample preparation procedures are necessary.

10.1.6 Comparability – Comparability expresses the confidence with which one data set can be compared to another and is directly affected by data quality (accuracy and precision) and sample handling (sampling, preservation, etc). Only data of known quality can be compared. The objective is to generate data of known quality with the highest level of comparability, completeness, and usability. This is achieved by employing the quality controls listed below and standard operating procedures for the handling and analysis of all samples. Data is reported in units specified by the client and using Columbia Analytical or project-specified data qualifiers.

10.2 Method Detection Limits and Method Reporting Limits & Limits of Detection/Quantitation

Method Detection Limits (MDL) for methods performed at Columbia Analytical/Simi are determined during initial method set up and if any significant changes are made. If an MDL study is not performed annually, the established MDL is verified by performing a limit of detection (LOD) verification on every instrument used in the analysis. The MDLs are determined by following the *SOP for Performing Method Detection Limits Studies and Establishing Limits of Detection and Quantitation* (ADM-MDL), which is based on the procedure in 40 CFR Part 136, Appendix B. As required by NELAP and DoD protocols, the validity of MDLs is verified using LOD verification samples.

The Method Reporting Limit (MRL) is the lowest amount of an analyte in a sample that can be quantitatively determined with stated, acceptable precision and accuracy under stated analytical conditions (i.e. limit of quantitation- LOQ). LOQ are analyzed on an annual basis and cannot be lower than the lowest calibration standard. Current MDLs and MRLs are available from the laboratory.

10.3 Quality Control Procedures

The specific types, frequencies, and processes for quality control sample analysis are described in detail in method-specific standard operating procedures and listed below. These sample types and frequencies have been adopted for each method and a definition of each type of QC sample is provided below.

10.3.1 Method Blank (a.k.a. Laboratory Reagent Blank)

The method blank is an analyte-free matrix (air, water, soil, etc.) subjected to the entire analytical process. When analyte-free soil is not available, anhydrous sodium sulfate, organic-free sand, or an acceptable substitute is used. The method blank is analyzed to demonstrate that the analytical system itself does not introduce contamination. The method blank results should be below the Method Reporting Limit (MRL) or, if required for DoD projects, < ½ MRL for the analyte(s) being tested. Otherwise, corrective action must be taken. A method blank is included with the analysis of every sample preparation batch, every 20 samples, or as stated in the method, whichever is more frequent.

10.3.2 Calibration Blanks

For some methods, calibration blanks are prepared along with calibration standards in order to create a calibration curve. Calibration blanks are free of the analyte of interest and, where applicable, provide the zero point of the calibration curve. Additional project-specific requirements may also apply to calibration blanks.

10.3.3 Continuing Calibration Blanks

Continuing calibration blanks (CCBs) are solutions of either analyte-free water, reagent, or solvent that are analyzed in order to verify the system is contamination-free when CCV standards are analyzed. The frequency of CCB analysis is either once every ten samples or as indicated in the method, whichever is greater. Additional project-specific requirements may also apply to continuing calibration blanks.

10.3.4 Calibration Standards

Calibration standards are vapors, liquids or solutions of known concentration prepared from primary standard or stock standard materials. Calibration standards are used to calibrate the instrument response with respect to analyte concentration. Standards are analyzed in accordance with the requirements stated in the particular method being used.

10.3.5 Initial (or Independent) Calibration Verification Standards

Initial (or independent) calibration verification standards (ICVs) are standards that are analyzed *after* calibration but *prior to* sample analysis, in order to verify the validity and accuracy of the standards used for calibration. Once it is determined that there is no defect or error in the calibration standard(s), standards are considered valid and may be used for subsequent calibrations and quantitative determinations (as expiration dates and methods allow). The ICV standards are prepared from materials obtained from a source independent of that used for preparing the calibration standards (“second-source”). ICVs are also analyzed in accordance with method-specific requirements.

10.3.6 Continuing Calibration Verification Standards

Continuing calibration verification standards (CCVs) are midrange standards that are analyzed in order to verify that the calibration of the analytical system is still acceptable. The frequency of CCV analysis is either once every ten samples, or as indicated in the method.

10.3.7 Internal Standards

Internal standards are known amounts of specific compounds that are added to each sample prior to instrument analysis. Internal standards are generally used for GC/MS procedures to correct sample results that have been affected by changes in instrument conditions or changes caused by matrix effects. The requirements for evaluation of internal standards are specified in each method and SOP.

10.3.8 Surrogates

Surrogates are organic compounds which are similar in chemical composition and chromatographic behavior to the analytes of interest, but which are not normally found in environmental samples. Depending on the analytical method, one or more of these compounds is added to method blanks, calibration and check standards, and samples (including duplicates, matrix spike samples, duplicate matrix spike samples and laboratory control samples) prior to extraction and analysis in order to monitor the method performance on each sample. The percent recovery is calculated for each surrogate, and the recovery is a measurement of the overall method performance.

Recovery (%) = (M/T) x 100

Where: M = The measured concentration of analyte,
T = The theoretical concentration of analyte added.

10.3.9 Laboratory Control Samples

The laboratory control sample (LCS) is an aliquot of analyte-free liquid, solid or air matrix to which known amounts of the method analyte(s) is (are) added. A reference material of known matrix type, containing certified amounts of target analytes, may also be used as an LCS. An LCS is prepared and analyzed at a minimum frequency of one LCS per 20 samples, with every analytical batch or as stated in the method, whichever is more frequent. The LCS sample is prepared and analyzed in exactly the same manner as the field samples.

The percent recovery of the target analytes in the LCS is compared to established control limits and assists in determining whether the methodology is in control and whether the laboratory is capable of making accurate and precise measurements at the required reporting limit. Comparison of batch-to-batch LCS analyses enables the laboratory to evaluate batch-to-batch precision and accuracy.

Recovery (%) = (M/T) x 100

Where: M = The measured concentration of analyte,
T = The theoretical concentration of analyte added.

10.3.10 Laboratory Fortified Blanks - LFB

A laboratory blank fortified at the MRL used to verify the minimum reporting limit. The LFB is carried through the entire extraction and analytical procedure. A LFB is required with every batch of drinking water samples.

10.3.11 Matrix Spikes (a.k.a. Laboratory Fortified Sample Matrix)

Matrix spiked samples are aliquots of samples to which a known amount of the target analyte (or analytes) is (are) added. The samples are then prepared and analyzed in the same analytical batch, and in exactly the same manner as are routine samples. For the appropriate methods, matrix spiked samples are prepared and analyzed and at a minimum frequency of one spiked sample (and one duplicate spiked sample, if appropriate) per twenty samples. The spike recovery measures the effects of interferences caused by the sample matrix and reflects the accuracy of the method for the particular matrix in question. Spike recoveries are calculated as follows:

$$Recovery\ (\%) = (S - A) \times 100 \div T$$

Where: S = The observed concentration of analyte in the spiked sample,
A = The analyte concentration in the original sample, and
T = The theoretical concentration of analyte added to the spiked sample.

Note: Matrix spiked samples are often not feasible for air matrices. Therefore, the MS shall be used as required by the test method and as specified by the corresponding method SOP.

10.3.12 Laboratory Duplicates and Duplicate Matrix Spikes

Duplicates are additional replicates of samples that are subjected to the same preparation and analytical scheme as the original sample. Depending on the method of analysis, either a duplicate analysis (and/or a matrix spiked sample) or a matrix spiked sample and duplicate matrix spiked sample (MS/DMS) are analyzed. The relative percent difference between duplicate analyses or between an MS and DMS is a measure of the precision for a given method and analytical batch. The relative percent difference (RPD) for these analyses is calculated as follows:

$$Relative\ Percent\ Difference\ (RPD) = (S1 - S2) \times 100 \div S_{ave}$$

Where S1 and S2 = The observed concentrations of analyte in the sample and its duplicate, or in the matrix spike and its duplicate matrix spike, and

S_{ave} = The average of observed analyte concentrations in the sample and its duplicate, or in the matrix spike and its duplicate matrix spike.

Depending on the method of analysis, either duplicates (and/or matrix spikes) or MS/DMS analyses are performed at a minimum frequency of one set per 20 samples. If an insufficient quantity of sample is available to perform a laboratory duplicate or duplicate matrix spikes, duplicate LCSs will be prepared and analyzed.

10.3.13 Control Charting

The generation of control charts is routinely performed at Columbia Analytical. Surrogate, Matrix Spike and LCS recoveries are all monitored and charted. In addition, the laboratory also monitors the Relative Percent Difference (RPD) measurement of precision. Control charts are available to each individual laboratory unit to monitor the data generated in its facility using control charts that have been programmed to identify various trends in the analytical results. If trends in the data are perceived, various means of corrective action may then be employed in order to prevent future problems with the analytical system(s).

Finally, data quality reports using control charts are generated for specific clients and projects pursuant to contract requirements. The control charting procedure is described in the SOP for *Control Limits* (ADM-CtrlLmt).

10.3.14 Glassware Washing

Glassware washing and maintenance play a crucial role in the daily operation of a laboratory. The glassware used at Columbia Analytical undergoes a rigorous cleansing procedure prior to every usage. The *SOP for Glassware Cleaning* (ADM-GLASS) has been generated and outlines the various procedures used at Columbia Analytical/Simi; each procedure is specific to the end-use of the equipment as well as to the overall analytical requirements of the project. In addition, other equipment that may be routinely used at the laboratory is also cleaned following instructions in the appropriate SOP.

10.3.15 Collection Efficiency

In the case of sampling trains (consisting of one or more multi-section sorbent tubes), which are received intact by the laboratory, the “front” and “back” sections shall be separated if required by the client. Each section shall be processed and analyzed separately and the analytical results reported accordingly.

10.3.16 Desorption Efficiency and Method Reporting Limits (Industrial Hygiene)

Desorption efficiency (DE) is the ability of an analytical method to recover the analyte from the collection media. Desorption efficiencies are determined initially and for each analyte to be reported. In addition, a DE study is performed each time there is a change in the test method, or with each new lot of media. Desorption efficiency shall be determined using sorbent media from the same lot number used for the field samples, if possible, and of the identical size and type. The DE values are used to correct the sample results (for all samples except passive samplers) before reporting.

Minimum reporting limits for each reportable analyte are determined initially by the analysis of spiked media, prepared at the desired reporting limit and carried through the entire analytical process. The reporting limit is verified or re-established annually (or if there is a change in methodology or instrumentation) and instrument performance is checked with each analytical batch through the analysis of an analytical standard prepared at the reporting limit.

10.3.17 Field and Trip Blanks

Field and trip blanks are analyzed when they are submitted to the laboratory for analysis. The actual field samples are flagged (when analytes are found in the blank) if and only if the laboratory is able to analyze the samples in the same analytical sequence as the corresponding field or trip blank. If this is not possible due to client submission restrictions then the results for the samples and blanks shall be reported independently with no flag. However, an explanation of this is included in the final report. This laboratory does not feel that Summa canisters are suitable for use as trip blanks. It is for this reason that the results for these types of containers are reported as separate samples and flagging is not considered appropriate.

11.0 DATA PROCESSING, VALIDATION, AND REPORTING

Columbia Analytical reports the analytical data produced in its laboratories to the client via the certified analytical report. This report includes a transmittal letter, a case narrative, client project information, specific test results, quality control data, chain of custody information, and any other project-specific support documentation. The following procedures describe our data reduction, validation and reporting procedures.

11.1 Data Reduction and Review

Results are generated by the analyst who performs the analysis and works up the data. All data is initially reviewed and processed by analysts using appropriate methods (e.g., chromatographic software, instrument printouts, hand calculation, etc.). Equations used for calculation of results are found in the applicable analytical SOPs. The resulting data set is either manually entered (e.g., titrimetric or microbiological data) into an electronic report form or is electronically transferred into the report from the software used to process the original data set (e.g., chromatographic software). The hardcopy version of the data is then reviewed by the analyst for accuracy. Once the primary analyst has checked the data for accuracy and acceptability, the hardcopy is forwarded to the supervisor or second qualified analyst, who reviews the data for errors. Where calculations are not performed using a validated software system, the reviewer rechecks a minimum of 10% of the calculations. When the entire data set has been found to be acceptable it is turned into the reporting department where final reports are generated and then validated by a Data Validation Coordinator. The hardcopy or electronic final report is physically or electronically signed by the project manager and the final report may be stored electronically or in hardcopy format. Test analysis data shall be kept in the appropriate service request folder. Data review and reporting procedures are described in the *SOP for Data Review and Reporting* (ADM-DATA_REV).

Policies and procedures for manual editing of data are established. The analyst making the change must initial and date the edited data entry, without obliteration of the original entry. The policies and procedures are described in the *SOP for Making Entries into Logbooks and onto Analytical Records* (ADM-DATANTRY).

Policies and procedures for electronic manual integration of chromatographic data are established. The analyst performing the integration must document the integration change by printing both the “before” and “after” integrations and including them in the raw data records. The policies and procedures are described in the *SOP for Manual Integration of Chromatographic Peaks* (ADM-INT).

11.2 Confirmation Analysis

11.2.1 Gas Chromatographic and Liquid Chromatographic Analyses

For gas chromatographic (GC) and liquid chromatographic (LC) analyses, all positive results are confirmed as required by the method, typically by a second column, a second detector, a second wavelength (HPLC/UV), or by GC/MS analysis, unless exempted by one of the following situations:

- The analyte of interest produces a chromatogram containing multiple peaks exhibiting a characteristic pattern, which matches appropriate standards. This is limited to petroleum hydrocarbon analyses (e.g., gasoline and diesel) and does not include polychlorinated biphenyls.
- The sample meets all of the following requirements:
  1. All samples (liquid or solid) come from the same source (e.g., groundwater samples from the same well) for continuous monitoring. Samples of the same matrix from the same site, but from different sources (e.g., different sampling locations) are not exempt.
  2. All analytes have been previously analyzed in sample(s) from the same source, identified and confirmed by a second column or by GC/MS. The chromatogram is largely unchanged from the one for which confirmation was carried out. The documents indicating previous confirmation must be available for review.

11.2.2 Confirmation Data

Confirmation data will be provided as specified in the method. Identification criteria for GC, LC or GC/MS methods are summarized below:

- GC and LC Methods
  1. The analyte must fall within plus or minus three times the standard deviation (established for the analyte/column) of the retention time of the daily midpoint standard in order to be qualitatively identified. The retention-time windows will be established and documented, as specified in the appropriate Standard Operating Procedure (SOP).
  2. When sample results are confirmed by two dissimilar columns or detectors, the agreement between quantitative results must be evaluated. The relative percent difference between the two results is calculated and evaluated against SOP and/or method criteria.
- GC/MS Methods - Two criteria are used to verify identification:
  1. Elution of the analyte in the sample will occur at the same relative retention time (RRT) as that of the analyte in the standard.
  2. The mass spectrum of the analyte in the sample must, in the opinion of a qualified analyst or the department manager, correspond to the spectrum of the analyte in the standard or the current GC/MS reference library.

11.3 Data Review and Validation of Results

The integrity of the data generated is assessed through the evaluation of the sample results, calibrations, and QC samples (method blanks, laboratory control samples, sample duplicates, matrix spikes, trip blanks, etc.). A brief description of the evaluation of these analyses is described below, with details listed in applicable SOPs. The criteria for evaluation of QC samples are listed within each method-specific SOP. Other data evaluation measures may include (as necessary) a check of the accuracy check of the QC standards and a check of the system sensitivity. Data transcriptions and calculations are also reviewed.

Note: Within the scope of this document, all possible data assessment requirements for various project protocols cannot be included in the listing below. This listing gives a general description of data evaluation practices used in the laboratory in compliance with NELAP Quality Systems requirements. Additional requirements exist for certain programs, such as projects under the DoD QSM protocols, and project-specific QAPPs.

- Method Calibration – Following the analysis of calibration blanks and standards according to the applicable SOP the calibration correlation coefficient, average response factor, etc. is calculated and compared to specified criteria. If the calibration meets criteria analysis may continue. If the calibration fails, any problems are isolated and corrected and the calibration standards reanalyzed. Following calibration and analysis of the independent calibration verification standard(s) the percent difference for the ICV is calculated. If the percent difference is within the specified limits the calibration is complete. If not, the problem associated with the calibration and/or ICV are isolated and corrected and verification and/or calibration is repeated.
- Continuing Calibration Verification (CCV) – Following the analysis of the CCV standard the percent difference is calculated and compared to specified criteria. If the CCV meets the criteria analysis may continue. If the CCV fails, routine corrective action is performed and documented and a 2nd CCV is analyzed. If this CCV meets criteria, analysis may continue, including any reanalysis of samples that were associated with a failing CCV. If the routine corrective action failed to produce an immediate CCV within criteria, then either acceptable performance is demonstrated (after additional corrective action) with two consecutive calibration verifications or a new initial calibration is performed.
- Method Blank – Results for the method blank are calculated as performed for samples. If results are less than the MRL (<½ MRL for DoD projects), the blank may be reported. If not, associated sample results are evaluated to determine the impact of the blank result. If possible, the source of the contamination is determined. If the contamination has affected sample results the blank and samples are reanalyzed. If positive blank results are reported, the blank (and sample) results are flagged with an appropriate flag, qualifier, or footnote.
- Sample Results (Inorganic) – Following sample analysis and calculations (including any dilutions made due to the sample matrix) the result is verified to fall within the calibration range. If not, the sample is diluted and analyzed to bring the result into calibration range. When sample and sample duplicates are analyzed for precision, the calculated RPD is compared to the specified limits.

The sample and duplicate are reanalyzed if the criteria are exceeded. The samples may require re-preparation and reanalysis. Results are reported when within the calibration range, or as estimates when outside the calibration range. When dilutions are performed the MRL is elevated accordingly.

- Sample Results (Organic) – For GC/MS analyses, it is verified that the analysis was within the prescribed tune window. If not, the sample is reanalyzed. Following sample analysis and calculations (including any dilutions made due to the sample matrix) peak integrations, retention times, and spectra are evaluated to confirm qualitative identification. Internal standard responses and surrogate recoveries are evaluated against specified criteria. If internal standard response does not meet criteria, the sample is diluted and reanalyzed. Results outside of the calibration range are diluted to within the calibration range. When dilutions are performed the MRL is elevated accordingly.
- Surrogate Results (Organic) – The percent recovery of each surrogate is compared to specified control limits. If recoveries are acceptable, the results are reported. If recoveries do not fall within control limits, the sample matrix is evaluated. When matrix interferences are present or documented, the results are reported with a qualifier that matrix interferences are present. If no matrix interferences are present and there is no cause for the outlier, the sample is reanalyzed. However, if the recovery is above the upper control limit with non-detected target analytes, the sample may be reported. All surrogate recovery outliers are appropriately qualified on the report.
- Duplicate Sample and/or Duplicate Matrix Spike Results – The RPD is calculated and compared to the specified control limits. If the RPD is within the control limits the result is reported. If not, an evaluation of the sample is made to verify that a homogenous sample was used and the results are compared to the MRL. The samples and duplicates are reanalyzed and if re-analysis also produces out-of-control results, the results are reported with an appropriate qualifier.
- Laboratory Control Sample Results – Following analysis of the LCS the percent recovery is calculated and compared to specified control limits. If the recovery is within control limits, the analysis is in control and results may be reported. If not, this indicates that the analysis is not in control. Samples associated with the 'out of control' LCS, shall be considered suspect and the samples reanalyzed or the data reported with the appropriate qualifiers.
- Matrix Spike Results – Following analysis of the MS the percent recovery is calculated and compared to specified control limits. If the recovery is within control limits the results may be reported. If not, and the LCS is within control limits, this indicates that the matrix potentially biases analyte recovery. It is verified that the spike level is at least five times the background level. If not, the results are reported with a qualifier that the background level is too high for accurate recovery determination. If matrix interferences are present or results indicate a potential problem with sample preparation, steps may be taken to improve results; such as dilution and reanalysis, or re-preparation and reanalysis. Results that do not meet acceptance limits are reported with an appropriate qualifier.

11.4 Data Reporting

When an analyst determines that a data package has met the data quality objectives (and/or any client-specific data quality objectives) of the method and has qualified any anomalies in a clear, acceptable fashion, the data package will undergo a peer review by a trained chemist. Prior to release of the report to the client, the Project Manager reviews and approves the entire report for completeness and to ensure that any and all client-specified objectives were successfully achieved. The original raw test data, along with a copy of the final report, is retained by service request number for archival purposes. Columbia Analytical maintains control of analytical results by adhering to standard operating procedures and by observing sample custody requirements. All data is calculated and reported in units consistent with project specifications, to enable easy comparison of data from report to report.

To the extent possible, samples shall be reported only if all QC measures are acceptable. If a QC measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure shall be reported with the appropriate data qualifier(s). The *SOP for Data Review and Reporting* (ADM-DATA_REV) addresses the flagging and qualification of data. The Columbia Analytical-defined data qualifiers, state-specific data qualifiers, or project-defined data qualifiers are used depending on project requirements. A case narrative may be written by the analyst or project manager to explain problems with a specific analysis or sample, etc.

For subcontracted analyses, the Project Manager verifies that the report received from the subcontractor is complete. This includes checking that the correct analyses were performed, the analyses were performed for each sample as requested, a report is provided for each analysis, and the report is signed. The Project Manager accepts the report if all verification items are complete. Acceptance is demonstrated by forwarding the report to the Columbia Analytical client.

11.5 Documentation

Columbia Analytical maintains a records system which ensures that all laboratory records of analysis data are retained and available. Analysis data is retained for 5 years from the report date unless contractual terms or regulations specify a longer retention time. Archival procedures are described in the *SOP for Data and Record Archiving* (ADM-ARC).

11.5.1 Documentation and Archiving of Sample Analysis Data

The archiving system includes, but is not limited to, the following items (where applicable) for each set of analyses performed:

- Benchsheets describing sample preparation (if appropriate) and analysis;
- Instrument parameters (or reference to the data acquisition method);
- Sample analysis sequence;
- Instrument printouts, including chromatograms and peak integration reports for all samples, standards, blanks, spikes, duplicates and reruns;
- Applicable standard identification numbers;
- Chain of custody, service request and sample acceptance check forms;
- Initial calibration and data review checklist(s);
- Copies of report sheets submitted to the work request file; and
- Copies of Nonconformity and Corrective Action Reports, if necessary.

Individual sets of analyses are identified by analysis date and service request number. Since many analyses are performed with computer-based data systems, the final sample concentrations can be automatically calculated. If additional calculations are needed, they are written on the integration report or securely stapled to the chromatogram, if done on a separate sheet.

For organics analysis, data applicable to all analyses within the batch, such as GCMS tunes, CCVs, batch QC, and analysis sequences; are kept using a separate documentation system. This system is used to archive data on a batch-specific basis and is segregated according to the date of analysis. This system also includes results for the most recent calibration curves, as well as method validation results.

11.6 Deliverables

In order to meet individual project needs, Columbia Analytical provides several levels of analytical reports. Standard specifications for each level of deliverable are described in Table 11-1. Variations may be provided based on client or project specifications. This includes (but is not limited to) the following specialized deliverables:

- ACOE/HTRW – Army Corps of Engineers specified data package and reporting requirements (HTRW, CERP, FUDS, etc.)
- AFCEE – Air Force Center for Environmental Excellence project-specific reporting

When requested by the client or relevant to the validity of reported results, the estimation of measurement uncertainty will be provided to a client or regulatory agency. How the uncertainty will be reported may be dictated by the client's reporting specifications. Procedures for determining and reporting uncertainty are given in the *SOP for Estimation of Uncertainty of Measurements* (ADM-UNCERT).

When requested, Columbia Analytical provides Electronic Data Deliverables (EDDs) in the format specified by client need or project specification. Columbia Analytical is capable of generating EDDs with many different formats and specifications. The EDD is prepared by report production staff using the electronic version of the laboratory report to minimize transcription errors. User guides and EDD specification outlines are used in preparing the EDD. The EDD is reviewed and compared to the final report for accuracy.

Table 11-1
Descriptions of Columbia Analytical Standard Data Deliverables

Tier I. Routine Certified Analytical Report includes the following:

1. Transmittal letter
2. Chain of custody documents and sample/cooler receipt documentation
3. Sample analytical results
4. Method blank results
5. Surrogate recovery results and acceptance criteria for applicable organic methods
6. Dates of sample preparation and analysis for all tests
7. Case narrative - **optional**

Tier II. In addition to the Tier I Deliverables, this includes the following:

1. Matrix spike result(s) with calculated recovery and including associated acceptance criteria
2. Duplicate or duplicate matrix spike result(s) (as appropriate to method), with calculated relative percent difference
3. Laboratory Control Sample result(s) with calculated recovery and including associated acceptance criteria
4. Case narrative - **optional**

Tier III. Data Validation Package. In addition to the Tier II Deliverables, this includes the following:

1. Case narrative - **required**
2. Summary forms for all associated QC and Calibration parameters, with associated control criteria/acceptance limits

Note: Other summary forms specified in QAPPs or project/program protocols, or those related to specialized analyses such as HRGC/MS will be included.

Tier IV. Full Data Validation Package.

1. All raw data associated with the sample analysis, including but not limited to:
   a. Preparation and analysis bench sheets and instrument printouts,
   b. For organics analyses, all applicable chromatograms, spectral, confirmation, and manual integration raw data. For GC/MS this includes tuning results, mass spectra of all positive hits, and the results and spectra of TIC compounds when requested.
   c. QC data,
   d. Calibration data (initial, verification, continuing, etc),
   e. Calibration blanks or instrument blanks (as appropriate to method).
2. If a project QAPP or program protocol applies, the report will be presented as required by the QAPP.

12.0 PERFORMANCE AND SYSTEM AUDITS

Quality audits are an essential part of Columbia Analytical/Simi's quality assurance program. There are two types of audits used at the facility: System Audits are conducted to qualitatively evaluate the operational details of the QA program, while Performance Audits are conducted by analyzing proficiency testing samples in order to quantitatively evaluate the outputs of the various measurement systems.

12.1 System Audits

The system audit examines the presence and appropriateness of laboratory systems. External system audits of Columbia Analytical/Simi are conducted regularly by various regulatory agencies and clients. Appendix G lists the certification and accreditation programs in which Columbia Analytical/Simi participates. Programs and certifications are added as required. Additionally, internal system audits of Columbia Analytical/Simi are conducted regularly under the direction of the Quality Assurance Program Manager. The internal audit procedures are described in the *SOP for Conducting Internal Laboratory Audits* (ADM-AUDIT). The internal audits are performed as follows:

- Comprehensive lab-wide system audit – performed annually. This audit is conducted such that systems, technical operations, hardcopy data, and electronic data are assessed.
- Technical/method audits – minimum of 3 per quarter
- Hardcopy report audits – minimum of 2 per quarter.
- Chromatographic electronic data audits – each applicable instrument per quarter.

All audit findings, and corrective actions are documented. The results of each audit are reported to the Laboratory Director and Department Managers for review. Any deficiencies identified are summarized in the audit report. Managers must respond with corrective actions correcting the deficiency within a defined timeframe. Should problems impacting data quality be found during an internal audit, any client whose data is adversely impacted will be given written notification within the corrective action period (if not already provided).

Electronic data audits may be performed in conjunction with hardcopy data audits. The electronic audits focus on organic chromatographic data and include an examination of audit trails, peak integrations, calibration practices, GCMS tuning data, peak response data, use of appropriate files, and other components of the analysis. The audit also verifies that the electronic data supports the hardcopy reported data.

Additional internal audits or data evaluations may be performed as needed to address any potential data integrity issues that may arise.

12.2 Performance Audits

Columbia Analytical/Simi also participates in the analysis of interlaboratory proficiency testing (PT) samples. Participation in PT studies is performed on a regular basis and is designed to evaluate all analytical areas of the laboratory. General procedures for these analyses are described in the *SOP for Proficiency Sample Testing Analysis* (ADM-PTS). Columbia Analytical routinely participates in the following studies:

- Water Pollution (WP) PT studies, 2 per year.
- Water Supply (WS) PT studies, 2 per year.
- Hazardous Waste/Soil PT studies, 2 per year.
- American Industrial Hygiene Association (AIHA) PT Program, 4 per year
- Air and Emissions PT studies, 2 per year
- Other studies as required for specific certifications, accreditations, or validations.

PT samples are processed by entering them into the LIMS system as samples (assigned Service Request, due date, testing requirements, etc.) and are processed the same as field samples. The laboratory sections handle samples the same as field samples, performing the analyses following method requirements and performing data review. The laboratory sections submit results to the QA Program Manager for subsequent reporting to the appropriate agencies or study provider. Results of the performance evaluation samples and audits are reviewed by the QA PM, Laboratory Director, the laboratory staff, and the Chief Quality Officer. For any results outside acceptance criteria, the analysis data is reviewed to identify a root cause for the deficiency, and corrective action is taken and documented through nonconformance (NCAR) procedures.

13.0 PREVENTIVE MAINTENANCE

Preventive maintenance is a crucial element of the Quality Assurance program. Instruments at Columbia Analytical (e.g., GC/MS systems, gas and liquid chromatographs, analytical balances, gas and liquid chromatographs, etc.) are maintained under commercial service contracts or by qualified, in-house personnel. All instruments are operated and maintained according to the instrument operating manuals. All routine and special maintenance activities pertaining to the instruments are recorded in instrument maintenance logbooks. The maintenance logbooks used at Columbia Analytical contain extensive information about the instruments used at the laboratory.

An initial demonstration of analytical control is required on every instrument used at Columbia Analytical before it maybe used for sample analysis. Each instrument must be recalibrated following any instrument maintenance which may change or effect the sensitivity or linearity of the instrument or if the continuing calibration verification acceptance criteria have not been met as specified in the standard operating procedure. If an instrument is modified or repaired, a return to analytical control is required before subsequent sample analyses can occur. When an instrument is acquired at the laboratory, the following information is noted in a bound maintenance notebook specifically associated with the new equipment:

- The equipment's serial number;
- Date the equipment was received;
- Date the equipment was placed into service;
- Condition of equipment when received (new, used, reconditioned, etc.); and
- Prior history of damage, malfunction, modification or repair (if known).

Preventive maintenance procedures, frequencies, etc. are available for each instrument used at Columbia Analytical. They may be found in the various SOPs for routine methods performed on an instrument and may also be found in the operating or maintenance manuals provided with the equipment at the time of purchase.

Responsibility for ensuring that routine maintenance is performed lies with the department supervisor or laboratory director. The supervisor may perform the maintenance or assign the maintenance task to a qualified bench level analyst who routinely operates the equipment. In the case of non-routine repair of capital equipment, the department supervisor is responsible for providing the repair, either by performing the repair themselves with manufacturer guidance or by acquiring on-site manufacturer repair. The laboratory maintains an adequate supply of expendable maintenance items (expected lifetime of part of less than 1 year.) These parts include items needed to perform the preventive maintenance procedures listed in Appendix E.

When performing maintenance on an instrument (whether preventive or corrective), additional information about the problem, attempted repairs, etc. is also recorded in the notebook. Typical logbook entries include the following information:

- Details and symptoms of the problem;
- Repairs and/or maintenance performed;
- Description and/or part number of replaced parts;
- Source(s) of the replaced parts;
- Analyst's signature and date; and
- Demonstration of return to analytical control.

See the table in Appendix E for a list of preventive maintenance activities and frequency for each instrument.

For further information regarding Instrumentation see the *SOP for Analytical Instrument Acquisition, Reassignment, Maintenance and Documentation* (ADM-INSTRUM).

14.0 CORRECTIVE AND PREVENTIVE ACTION

The laboratory takes all appropriate steps necessary to ensure all sample results are reported with acceptable quality control results. When sample results do not conform to established quality control procedures, responsible management will evaluate the significance of the nonconforming work and take corrective action to address the nonconformance.

Nonconforming events such as errors, deficiencies, deviations from SOP, proficiency (PT) failure or results that fall outside of established QC limits are documented using a *Nonconformity and Corrective Action Report* form (See Figure 14-1). The procedure and responsibilities for addressing nonconforming work is defined in the *SOP for Corrective Action* (ADM-CA). Nonconformances are reported to the client using various means (voice, email, narrative, etc). When a nonconformance occurs that casts doubt on the validity of the test results or additional client instructions are needed, the Project Manager notifies the client the same business day that the nonconformance is confirmed and reported. The QA PM reviews each problem, ensuring that appropriate corrective action has been taken by the appropriate personnel. The Nonconformity and Corrective Action Report (NCAR) is filed in the associated service request file and a copy is kept by the QA PM. The QA PM periodically reviews all NCARs looking for chronic, systematic problems that need more in-depth investigation and alternative corrective action consideration. In addition, the appropriate Project Manager is promptly notified of any problems in order to inform the client and proceed with any action the client may want to initiate.

If a quality control measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure shall be reported with the appropriate data qualifier(s). Failure to meet established analytical controls, such as the quality control objectives, prompts corrective action. Corrective action may take several forms and may involve a review of the calculations, a check of the instrument maintenance and operation, a review of analytical technique and methodology, and reanalysis of quality control and field samples. If a potential problem develops that cannot be solved directly by the responsible analyst, the supervisor, team leader, the department manager, and/or the QA PM may examine and pursue alternative solutions. In addition, the appropriate Project Manager is notified in order to ascertain if the client needs to be notified.

Part of the corrective action process involves determining the root cause. Identifying the root cause of a nonconformance can be difficult, but important for implementing effective corrective action. Root cause principles are used to determine assignable causes, which leads to corrective action taken to prevent recurrence. Various preventive action processes are used for eliminating a potential problem or averting a problem before it occurs. This is explained in the *SOP for Preventive Action* (ADM-PA).

In addition to internal communication of data issues, the laboratory also maintains a system for dealing with customer complaints. The person who initially receives the feedback (typically the Project Manager) is responsible for documenting the complaint. If the Project Manager is unable to satisfy the customer, the complaint is brought to the attention of the Client Services Manager, Laboratory Director, or QA PM for final resolution. The complaint and resolution are documented. The procedure is described in the *SOP for Handling Customer Feedback* (ADM-FDBK).

Figure 14-1

Nonconformity & Corrective Action Report

NONCONFORMITY

NCAR No. _____

PROCEDURE (SOP / METHOD): EVENT DATE: _____

EVENT: ☐ Missed Holding Time ☐ QC Failure ☐ Lab Error (spilled sample, spiking error, etc.)
☐ Method Blank Contamination ☐ Login Error ☐ Project Management Error
☐ Equipment Failure ☐ SOP Deviation ☐ Leaking Can (ID:) ☐Other (describe):

SR#/CUSTOMERS/SAMPLES/SYSTEMS AFFECTED:

DETAILED DESCRIPTION:

ORIGINATOR: _____ DATE: _____ PROJECT MANAGER(S): _____ NOTIFIED BY: _____ DATE: _____

ROOT CAUSE ANALYSIS

☐ Calculations ☐ Human Error ☐ Instrumentation ☐ Lab Control Charts ☐ Policies and/or Procedures ☐ Training
☐ Sample Documentation ☐ Sample Log-in ☐ Sample Preparation ☐ Sample Storage ☐ Software/Temp. ☐ Other

DETAILED DESCRIPTION:

CORRECTIVE ACTION & OUTCOME

Re-establishment of conformity must be demonstrated and documented. Describe the steps that were taken, or are planned to be taken, to correct the particular Nonconformity and prevent its reoccurrence. Include PM instructions here.

Is the data to be flagged in the Analytical Report with an appropriate qualifier? ☐ **No** ☐ **Yes**

APPROVAL & NOTIFICATION

Supervisor Verification & Approval of Corrective Action: _____ **Date:** _____
Comments: _____

Project Manager - Verification & Approval of Corrective Action: _____ **Date:** _____
Customer Notified by: ☐ Telephone ☐ Fax ☐ E-mail ☐ Narrative ☐ Not notified
Comments: _____

QA Program Manager – Assessment & Approval of Corrective Action:
Error: ☐ Random ☐ Systematic Is Data Affected? ☐ Yes ☐ No Is Data Acceptable? ☐Yes ☐ No
Is Corrective Action required, implemented and determined to be effective? ☐Yes ☐No ☐NA
QA PM Approval: _____ **Date:** _____
Comments: _____
(Attach record or cite reference where record is located.)

15.0 QUALITY ASSURANCE REPORTS AND MANAGEMENT REVIEW

Quality assurance requires an active, ongoing commitment by Columbia Analytical personnel at all levels of the organization. Communication and feedback mechanisms are designed so that analysts, supervisors and managers are aware of QA issues in the laboratory. Analysts performing routine testing are responsible for generating a data quality narrative or data review document with every analytical batch processed. This report also allows the analyst to provide appropriate notes and/or a narrative if problems were encountered with the analyses. A Non-Conformity and Corrective Action Report (NCAR) (see Section 14.0) may also be attached to the data prior to review. Supervisors or qualified analysts review all of the completed analytical batches to ensure that all QC criteria have been examined and any deficiencies noted and addressed.

It is the responsibility of each laboratory unit to provide the reporting department with reviewed data accompanied by signature approval. The data validation coordinators provide the Project Manager with a final report of the data. Footnotes and/or narrative notes must accompany any data package if problems were encountered that require further explanation to the client. Each data package is submitted to the appropriate Project Manager, who in turn reviews the entire collection of analytical data for completeness and to ensure that any and all client-specified objectives were successfully achieved. A case narrative is written (or approved) by the Project Manager to explain any unusual problems with a specific analysis or sample, etc.

The QA PM provides overview support to the Project Managers as required (e.g., contractually specified, etc.). The QA PM is also responsible for the oversight of all internal and external audits, for all proficiency testing sample and analysis programs, and for all laboratory certification/accreditation responsibilities. The QA PM regularly communicates with the Laboratory Director to review the various QA/QC activities, priorities, and status of program implementation; including such topics as the following:

- Status, schedule, and results of internal and external audits;
- Status, schedule, and results of internal and external proficiency testing studies;
- Status of certifications, accreditations, and approvals;
- Status of QA Manual and SOP review and revision;
- Status of MDLs studies;
- Discussion of QC problems in the laboratory;
- Discussion of corrective action program issues;
- Status of staff training and qualification; and
- Other topics as appropriate.

An annual management review of the quality and testing systems is performed as described in the *SOP for Managerial Reviews of the Laboratory's Quality Systems and Testing Activities* (ADM-MGMTRVW). This is done to identify any necessary changes or improvements to the quality system or quality assurance policies. This review is documented in a Managerial Review of the Laboratory's Quality Systems and Testing Activities and sent to senior management.

16.0 PERSONNEL TRAINING

Technical position descriptions are available for all employees, regardless of position or level of seniority. These documents are maintained by the Human Resources personnel and are available for review. In order to assess the technical capabilities and qualifications of a potential employee, all candidates for employment at Columbia Analytical are evaluated, in part, against the appropriate technical description.

Training begins the first day of employment at Columbia Analytical when the company policies are presented and discussed. Safety and QA/QC requirements are integral parts of all technical SOPs and, consequently, are integral parts of all training processes at Columbia Analytical. Safety training begins with reading the *Environmental Health and Safety Manual.* Employees are also required to participate in periodic safety training performed by the Environmental, Health and Safety Officer.

Employees are responsible for complying with the requirements of the QA Manual and QA/QC requirements associated with their function(s). Quality Systems training begins with Quality Assurance orientation for new employees and reading the Quality Assurance Manual. During the employees first year, the employee attends Core Ethics training and learns about Columbia Analytical Services quality systems. Each employee participates in annual Ethics Refresher training, which is part of the Columbia Analytical Improper Practices Prevention Program.

Columbia Analytical also encourages its personnel to continue to learn and develop new skills that will enhance their performance and value to the Company. Ongoing training occurs for all employees through a variety of mechanisms. The corporate, company-wide training and development program, external and internal technical seminars and training courses, and laboratory-specific training exercises are all used to provide employees with professional growth opportunities.

All technical training is documented and records are maintained by the QA department. Training requirements and its documentation are described in the *SOP for Documentation of Training* (ADM-TRANDOC). A training plan is developed whenever an employee starts a new procedure or new position. The training plan includes a description of the step-by-step process for training an employee and for initial demonstration of capability. Where the analyst performs the entire procedure, a generic training plan may be used.

16.1 Initial Demonstration of Capability (IDOC)

Training in analytical procedures typically begins with the reading of the Standard Operating Procedure (SOP) for the method. Hands-on training begins with the observation of an experienced analyst performing the method, followed by the trainee performing the method under close supervision, and culminating with independent performance of the method on quality control samples. Successful completion of the applicable Demonstration of Capability analysis qualifies the analyst to perform the method independently. Demonstration of Capability is performed by one of the following:

- Successful completion of an Initial Precision and Recovery (IPR) study (required where mandated by the method).
- Analysis of 4 consecutive Laboratory Control Samples, with acceptable accuracy and precision.
- Where spiking is not possible but QC standards are used ("non-spiked" Laboratory Control Samples), analysis of 4 consecutive Laboratory Control Samples with acceptable accuracy and precision.
- Where one of the three above is not possible, special requirements are as follows:
    - Total Settleable Solids: Successful single-blind PT sample analysis and duplicate results with RPD<10%.
    - Color: Four consecutive prepared LCSs with acceptable accuracy and precision of <10% RSD.
    - Physical Tests (Grain size, Corrosivity to Steel, etc.): Supervisor acknowledgement of training and approval.

A flowchart identifying the Demonstration of Proficiency requirements is given in Figure 16-1. The flowchart identifies allowed approaches to assessing Demonstration of Capability when a 4-replicate study is not mandated by the method, when spiking is not an option, or when QC samples are not readily available.

16.2 Continuing Demonstration of Proficiency

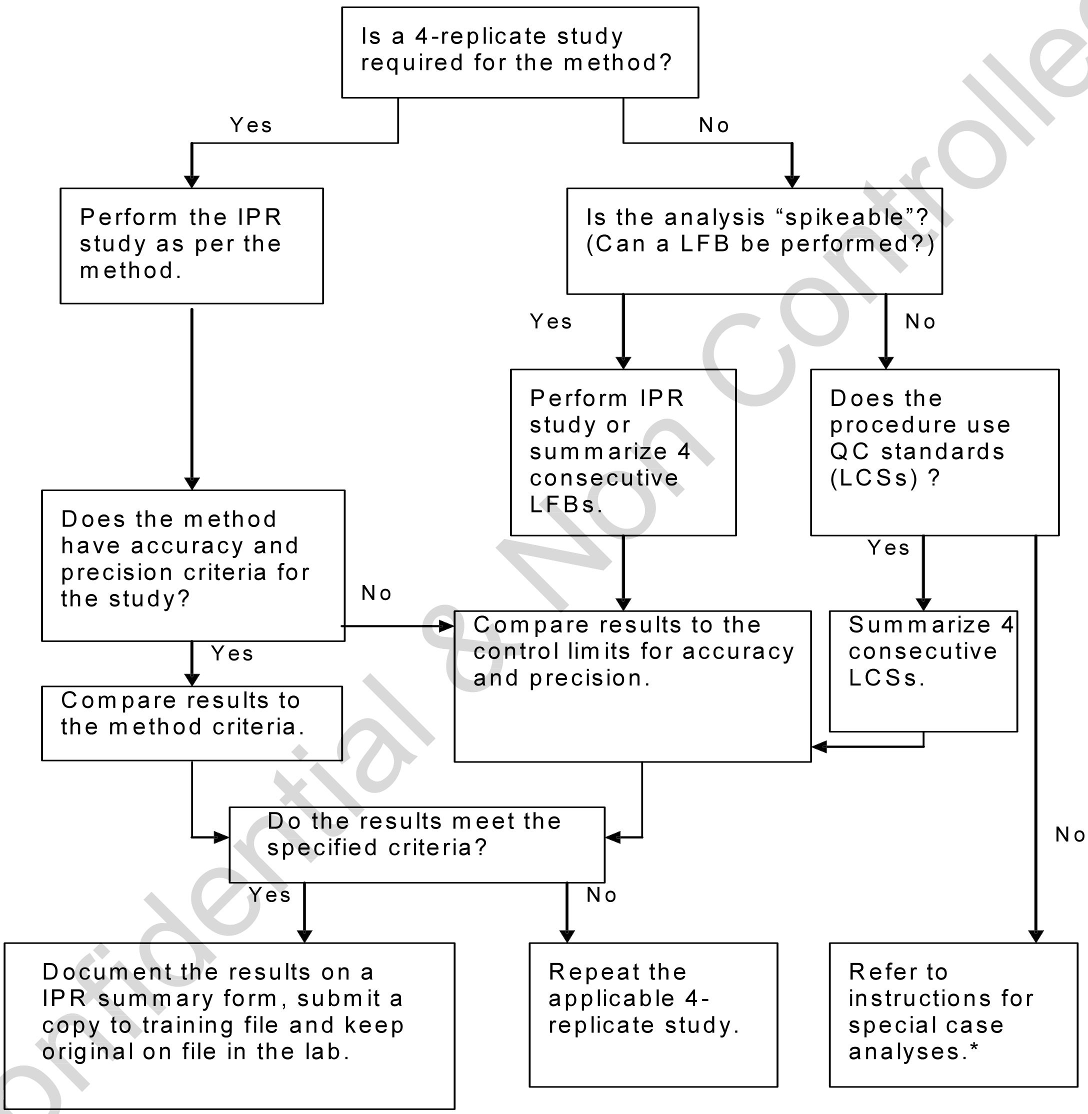
A periodic demonstration of proficiency is required to maintain continuing qualification. Continuing Demonstration of Proficiency is required each year, and may be performed one of the following ways:

- Successful performance on external (independent) single-blind sample analyses using the test method, or a similar test method using the same technology. I.e. PT sample or QC sample blind to the analyst.
- Performing Initial Demonstration of Capability as described above, with acceptable levels of precision and accuracy.
- Analysis of at least 4 consecutive LCSs with acceptable levels of accuracy and precision from in-control analytical batches.
- If the above cannot be performed, analysis of authentic samples with results statistically indistinguishable from those obtained by another trained analyst.
- For methods for which PT samples are not available and a spiked analysis (LFB, MDL, etc.) is not possible, analysis of field samples that have been analyzed by another analyst with statistically indistinguishable results.

16.3 Documentation of Training

Records are maintained to indicate the employee has the necessary training, education, and experience to perform their functions. Information of previously acquired skills and abilities for a new employee is maintained in Human Resources personnel files and Columbia Analytical resumes. QA maintains a database to record the various technical skills and training acquired while employed by Columbia Analytical. Information includes the employee's name, a description of the skill including the appropriate method and SOP reference, the mechanism used to document proficiency, and the date the training was completed. General procedures for documenting technical training are described in the *SOP for Documentation of Training* (ADM-TRANDOC).

Figure 16-1
Initial Demonstration of Capability Requirements[a]



[a] For IDOC IPR or LFB studies, "second-source" reference materials are used, as per TNI/NELAP requirements
* Refer to the SOP for Documentation of Training for details.

17.0 REFERENCES FOR QUALITY SYSTEMS, EXTERNAL DOCUMENTS, MANUALS, STANDARDS, AND ANALYTICAL PROCEDURES

The analytical methods used at Columbia Analytical generally depend upon the end-use of the data. Since most of our work involves the analysis of environmental samples for regulatory purposes, specified federal and/or state testing methodologies are used and followed closely. Typical methods used at Columbia Analytical are taken from the following references:

- National Environmental Laboratory Accreditation Program (NELAP), 2003 Quality Standards
- 2009 TNI Standards.
- American National Standard *General requirements for the competence of testing and calibration laboratories,* ANSI/ISO/IEC 17025:2005(E)
- *DoD Quality Systems Manual for Environmental Laboratories,* Version 4.2, 10/25/2010
- American Industrial Hygiene Association-LAP, LLC Policy Document Modules (2A Revision 10, April 1, 2010; 2B Revision 8, April 1, 2010; 6B Revision 6, August 1, 2009), Appendix H (Revision 0, April 1, 2010), and Appendix G (Revision 0, April 1, 2010). (Obsolete after September 12, 2011)
- American Industrial Hygiene Association-LAP, LLC Policy Document Modules (2A Revision 11, July 15, 2011; 2B Revision 9, July 15, 2011; 6 Revision 0, July 15, 2011), Appendix G (Revision 1, July 15, 2011), and Appendix H (Revision 0, April 1, 2010). (Effective September 13, 2011)
- 3M Organic Vapor Monitor Sampling and Analysis Guide, *Organic Vapor Monitors 3500/3510 and Organic Vapor Monitors 3520/3530*, Technical Bulletin 1028, January 1, 2004.
- 40 CFR Part 60, Test Methods for Standards of Performance for New Stationary Sources, Appendix A.
- 40 CFR Part 63, Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, Appendix A.
- 40 CFR Part 63, National Emission Standards for Hazardous Air Pollutants for Source Categories, Subchapter C.
- 40 CFR Part 136, Definition and Procedure for the Determination of the Method Detection Limit, Appendix B
- American Society for Testing and Materials (ASTM), Gaseous Fuel, Coal and Coke, Volume 05.06, September 2006.
- American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Philadelphia, PA.
- Arizona Administrative Code, *Department of Health Services – Laboratories*, Title 9, Ch. 14, Article 6. *Licensing of Environmental Laboratories*, R9-14-601 through R9-14-621, December 31, 2006 (Supp. 06-4)

- California Environmental Protection Agency Air Resources Board, *Methods for Determining Emissions of Toxic Air Contaminants from Stationary Sources*, Volume 3, July 28, 1997.
- California Code of Regulations (CCR), Title 22, Chapter 11 *Identification and Listing of Hazardous Waste*, 7/20/05.
- Minnesota Administrative Rules, *Department of Health*, Chapter 4740, Laboratories; Accreditation Requirements.
- *Good Automated Laboratory Practices, Principles and Guidance to Regulations For Ensuring Data Integrity In Automated Laboratory Operations*, EPA 2185 (August 1995).
- Environmental Protection Agency, Methods Update Rule (MUR), Guidelines for Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Analysis and Sampling Procedures; 40 CFR Parts 122, 136, 143, 430, 455 & 465; Final Rule 3/12/07, Effective April 11, 2007.
- Environmental Protection Agency*, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, Third Edition, 1986 and Updates I (7/92), II (9/94), III (12/96), IIIA (4/98), IIIB (11/04), IVA & IVB. See Chapters 1, 2, 3, 4, 5, 6, and 8.
- Environmental Protection Agency, *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, 1983.
- Environmental Protection Agency, *Methods for the Determination of Inorganic Substances in Environmental Samples,* EPA 600/R-93-100, August 1993.
- Environmental Protection Agency, *EPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*, Second Edition, EPA/625/R-96-010b, January 1999.
- Environmental Protection Agency, *EPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*, Second Edition Addendum, October 4, 2000.
- HQ Air Force Center for Environmental Excellence, Technical Services Quality Assurance Program, Guidance for Contract Deliverables, Appendix C: Quality Assurance Project Plan (QAPP), Final Version 4.0.02, May 2006.
- National Institute for Occupational Safety and Health (NIOSH) *Manual of Analytical Methods*, Third Edition (August 1987); Fourth Edition (August 1994); 1st Supplement Publication 96-135, 2nd Supplement Publication 98-119, 3rd Supplement 2003-154
- National Council for Air and Stream Improvement, Inc. (NCASI). 2007*. Appendix E - Technical Bulletin Cross Reference Guide for NCASI Methods.* Methods Manual (05).
- *SKC 575 Series Passive Sampler Rate/Selection Guide,* Form #37021, Rev 0012.
- *Standard Methods for the Examination of Water and Wastewater*, 20th Edition (1998).
- South Coast Air Quality Management District, *Laboratory Methods of Analysis for Enforcement Samples.*
- U.S. Department of Labor, Occupational Safety and Health Administration *OSHA Analytical Methods Manual.*

APPENDIX A

LIST OF QA PROGRAM DOCUMENTS AND STANDARD OPERATING PROCEDURES

CAS Quality and Ethics Policy Statement
September 2010

Columbia Analytical Services (CAS) is committed to excellence and superior performance in everything we do. This includes ethics and professional practice where CAS is committed to the highest standards of ethical behavior and quality of its analytical testing. We will not sacrifice our ethical principles in order to achieve business success, because unethical behavior carries a heavy price - one that we do not want to bear. This includes diminished self respect, loss of reputation, loss of business, civil and criminal penalties, and government and customer sanctions.

This means we will always strive to conduct business honestly and with integrity. We will always follow and obey the laws and statutes applicable to the operation of our business. We will always follow, to the best of our ability, standard operating procedures, rules and regulations that apply to our industry and specifically to our laboratory operations. Our customers, employees, suppliers and communities that we serve expect and deserve nothing less than the highest standards of conduct and compliance.

The following are the critical elements of the Quality and Ethics program at CAS.

- The Executive Management and Board of Directors of CAS sponsor and support the Quality and Ethics program through their personal commitment and by providing the necessary resources to promote this program throughout the organization.
- Chief Quality and Ethics Officer. The position is responsible for the quality and ethics program, ensures that appropriate resources are provided, reviews and recommends changes in the program, and resolves ethical and quality issues brought to management attention. This Officer periodically provides a quality and ethics report directly to the Board of Directors.
- Core Values. The CAS Statement of Core Values was developed internally with input from the entire company. We are committed to ensuring the integrity and quality of data, and meeting the needs of our clients, while conducting business with high ethical standards. We hold strong to the core values of Honor, Truth, and Fairness. We are committed to these values and rely on them when confronted by difficult choices.
- Code of Conduct. CAS supports the ethical codes established for the laboratory industry by the American Council of Independent Laboratories (ACIL) and is committed to meeting the data integrity and ethics requirements of accreditation bodies; including NELAP and the Department of Defense (DOD). The "CAS Commitment to Excellence in Data Quality" statement must be acknowledged and signed by all employees; and all employees are expected to comply with standards outlined in Section 6, Employee Conduct, of our Employee Handbook. All personnel concerned with analytical testing activities within the laboratory are required to be familiar with the quality documentation and to implement these policies and procedures in their work.

Columbia Analytical Services

- Open Door Policy. CAS will maintain a work environment where employees have the right and obligation for open communications to ask questions, seek guidance, and report incorrect practices and wrong doing without fear of retribution. This is described in the CAS Open Door Policy in the Employee Handbook. CAS believes that using the chain-of-command channels for this dialogue is generally most appropriate. However, if there is apprehension or a concern that using this approach is not appropriate, employees are free to take their concerns to the President/CEO, the Director of Human Resources, or the Chief Quality Officer. Employees may do so without fear of retribution.
- Ombudsman Program. In addition to the Open Door Policy, CAS has implemented an external ombudsman/hotline program through EthicsPoint, a phone and internet-based reporting system. This is another mechanism available to enhance communication and empower employees to promote quality, data integrity, and ethical behavior. Employees can file a report anonymously to address ethics, data integrity, or improper conduct issues in the workplace.
- Internal Audits. Policies are established to ensure that internal systems and data audits are conducted periodically in addition to external agency and client audits. The data audits include assessments of both hardcopy data and electronic data to ensure on-going data integrity and compliance with the CAS Quality program.
- Certification/Accreditation Compliance. CAS management is committed to ensuring compliance with the accreditation or certification standards applicable to each CAS laboratory, including NELAP accreditations at laboratories conducting environmental testing and DOD ELAP accreditation at laboratories performing testing for the DOD. Required quality systems are documented in QA Manuals, administrative Standard Operating Procedures (SOPS) and policies; and technical SOPs.
- Ethics Training. CAS provides training to its employees with respect to quality, ethics, data integrity, and business conduct. This includes introductory training on employment policies, quality, and ethics at the time of hire; in-depth "core" ethics training within one year of hire, and on-going ethics refresher training on a semi-annual basis.

The CAS Quality and Ethics Program has been in place for several years. However, this is a "living" program that will change and improve as the company grows and changes.

James M Carlson — 9-28-10

Jim Carlson, President/CEO — Date

Lee Wolf — 9-21-10

Lee Wolf, Chief Quality and Ethics Officer — Date

Name / Title	Signature	Initials	Years of Experience
Kelly Horiuchi, B.A.* *Laboratory Director & Project Manager*	Kelly M Horiuchi	KMH	11
Michael Tuday, B.S.* *Director of Research and Development*	[illegible]	MT	31
Ku-Jih Chen, B.S. *Director of Technology Development*	[illegible]	KJC	36
Chaney Humphrey, B.S.* *Quality Assurance Program Manager*	Chaney Humphrey	CH	7
Nick Nash, A.S. *Quality Assurance Assistant*	Nick Nash	NN	5
Wade Henton, B.S.* *Team Leader (Volatiles GC - Air)*	[illegible]	WH	25
Chris Parnell, B.S.* *Technical Director (VOA GC/MS – Air)*	Chris Parnell	CP	25
Madeleine Dangazyan, B.S.* *Team Leader (Semi-Volatiles/ Industrial Hygiene)*	Madeleine Dangazyan	MD	16
Wida Ang, B.S., M.S.* *Chemist, Team Leader (Volatiles GC/MS – Air)*	Wida Ang	WA	26
Sue Anderson, B.S.* *Project Manager / Technical Director (General Chemistry)*	Sue Anderson	SA	21
Samantha Henningsen, B.S. * *Project Manager*	Samantha Henningsen	SH	2
Kathleen Aguilera, B.A.* *Project Manager*	Kate Aguilera	KA	22
Robin Gill *Data Validation Coordinator / Team Leader (Reporting)*	Robin Gill	RG	31
Rusty Bravo, B.S. *Data Validation Coordinator*	[illegible]	[illegible]	21
Robert De La O *Systems Analyst / IT*	[illegible]	[illegible]	21
Shreejana Singh, B.S. *Systems Analyst*	[illegible]	SSM	6

* Approved Signatory

Name / Title	Signature	Initials	Years of Experience
Manny Zamora *Team Leader (Sample Management)*	[illegible]	[illegible]	9
Karen Ryan, B.S. *Team Leader –Canister Cleaning & Shipping, Alternate Sample Management Custodian / Environmental Health & Safety Officer*	[illegible]	KR	20
Sasha Sommer, B.S. *GC/MS Analyst*	[illegible]	[illegible]	2
Llesenia Cercado, A.S. *GC/MS Analyst*	[illegible]	LC	11
Simon Cao, B.S. *GC/MS Analyst*	[illegible]	[illegible]	18
Lusine Hakobyan, B.S. *GC/MS Analyst*	[illegible]	LH.	7
Elsa Moctezuma, B.S. *GC/MS Analyst*	[illegible]	EM	7
Chris Cornett, B.S., M.S. *GC/MS Analyst*	[illegible]	CC	5
Chris Rosney, B.S. *GC/MS Analyst*	[illegible]	CR	-
John Rice, B.S. *GC/MS Analyst*	[illegible]	JR	13
Zheng Wang, B.S., M.S. *SVOA Analyst*	[illegible]	ZW	23
Gilbert Gutierrez *SVOA Technician*	[illegible]	GG	17
Lauryn Keeler, B.S. *GC Analyst*	[illegible]	LK	2
Dante Muñoz-Castañeda, B.S. *GC Analyst*	[illegible]	[illegible]	2

QA Program Files

Item	Name / Location	
Software Quality Assurance Plan	SQAP.pdf	
Simi Valley Certification Status	Cert Status.xls	
Control Limit\Chart Status	CntrlChrt(status1).xls	
MDL,LOD,LOQ Tracking Spreadsheet	MDL Status Table (EACH DEPT).xls	
Method Detection & Method Reporting Limits	MDL and MRLs (dept.).xls	
Technical Training Status Spreadsheet	Training Status.xls	
Master List of Controlled Documents (Logbooks, SOPs, etc.)	Master List of Controlled Documents.xls	
Personnel Resumes, Transcripts	HR & QA Departments	
Job Descriptions	HR Department / Network Drive	
NCARS	Q:\NCARS	
Employee Signature Log	QA Office	
Employee Technical Training Records	QA Office	
QA Audits & Annual Management Review Report	QA Office	
Equipment Calibration Records	QA Office	
PT Reports	Q:\PT Reports\	QA Office
Data Quality Objectives Spreadsheet	CAS DQO Spreadsheet.xls	

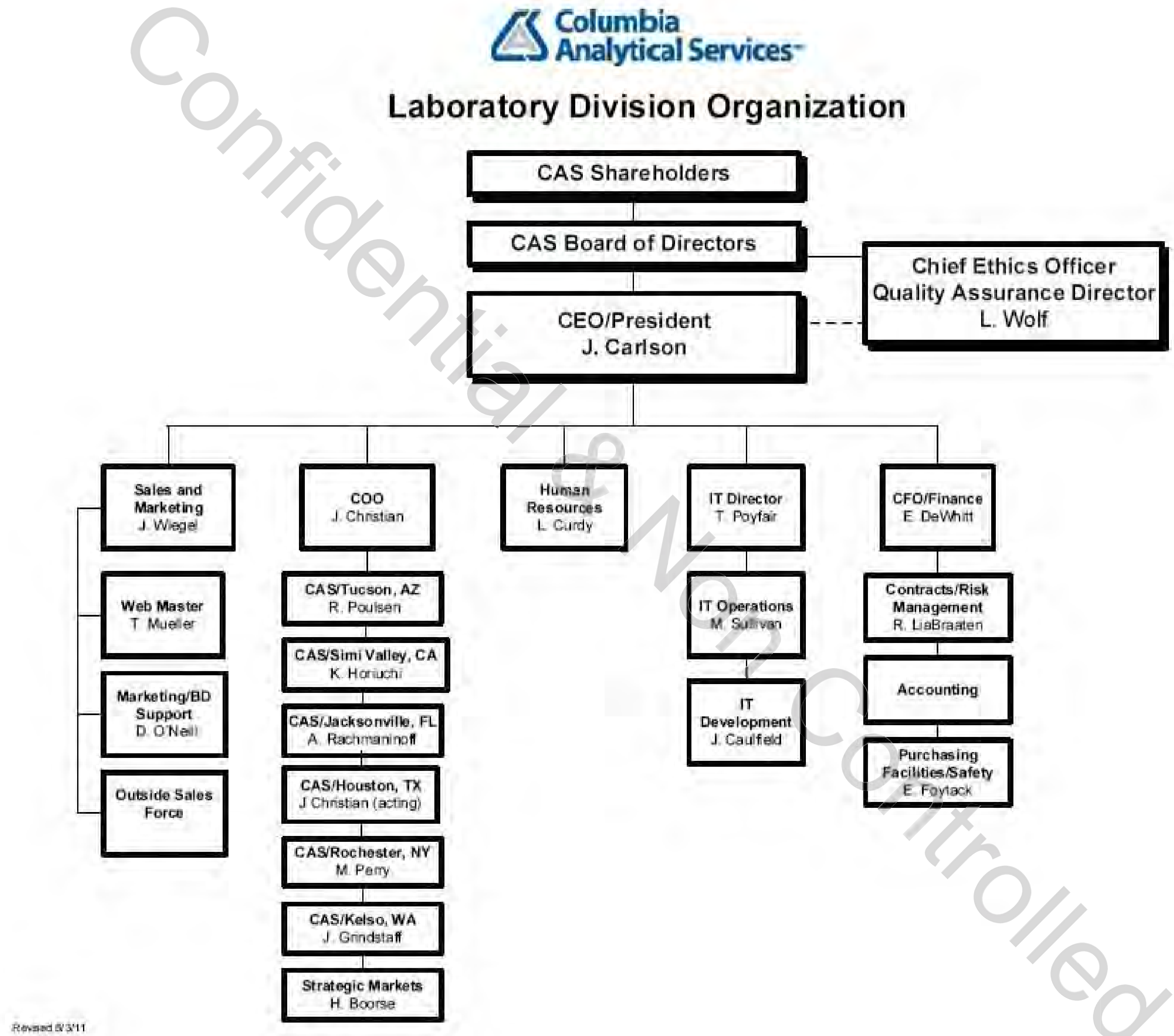
Corporate Policy Titles	Policy Effective Date
CAS Quality and Ethics Policy Statement	9/28/10
Policy for Data Review and Validation	9/10/10
Policy for Internal Quality Assurance Audits	7/1/09
Policy for Standards and Reagents Expiration Dates	9/28/09
Policy for the use of Accreditation Organization Names, Symbols and Logos	10/1/09

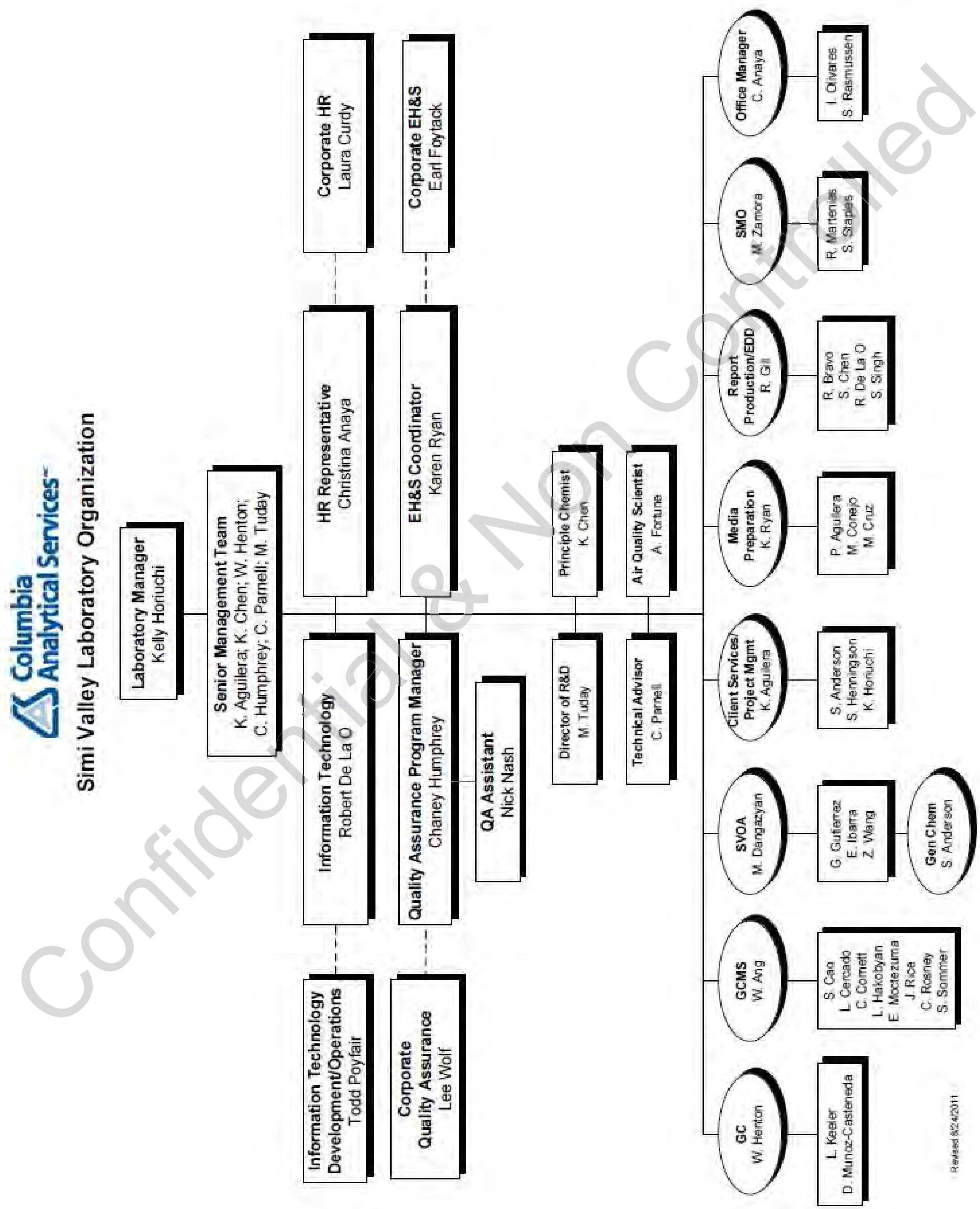
Corporate SOP Titles	SOP Code
Corrective Action	ADM-CA
Checking New Lots of Chemicals for Contamination	ADM-CTMN
Control Limits	ADM-CTRL_LIM
Making Entries Into Logbooks and Onto Analytical Records	ADM-DATANTRY
Data Recall	ADM-DATARECALL
Document Control	ADM-DOC_CTRL
SOP for Document Management Policy Implementation	ADM-DOC_MGMT
Preparation of Electronic Data for Organic Analyses for E-Data Auditing	ADM-E_DATA
Handling Customer Feedback	ADM-FDBK
Manual Integration of Chromatographic Peaks	ADM-INT
SOP for Method Development, Investigation, and Transfer	ADM-MDEV
Performing Method Detection Limit Studies and Establishing Limits of Detection and Quantitation	ADM-MDL
Managerial Review of the Laboratory's Quality Systems and Testing Activities	ADM-MGMTRVW
Preventive Action	ADM-PA
Proficiency Testing Sample Analysis	ADM-PTS
Purchasing and Approval of Vendors	ADM-PUR
Significant Figures	ADM-SIGFIG
Preparation of Standard Operating Procedures	ADM-SOP
Qualification of Subcontract Laboratories	ADM-SUBLAB
Documentation of Training	ADM-TRANDOC
Estimation of Uncertainty of Measurements	ADM-UNCERT

APPENDIX B

ORGANIZATIONAL CHART AND RESUMES OF KEY PERSONNEL

Laboratory Division Organization




Columbia Analytical Services
Simi Valley Laboratory Organization
Laboratory Manager Kelly Horiuchi
Senior Management Team K. Aguilera; K. Chen; W. Henton; C. Humphrey; C. Parnell; M. Tuday
HR Representative Christina Anaya
Corporate HR Laura Curdy
EH&S Coordinator Karen Ryan
Corporate EH&S Earl Foytack
Information Technology Robert De La O
Information Technology Development/Operations Todd Poyfair
Quality Assurance Program Manager Chaney Humphrey
Corporate Quality Assurance Lee Wolf
QA Assistant Nick Nash
Principle Chemist K. Chen
Air Quality Scientist A. Fortune
Director of R&D M. Tuday
Technical Advisor C. Parnell
Office Manager C. Anaya
I. Olivares S. Rasmussen
SMO M. Zamora
R. Martenies S. Staples
Report Production/EDD R. Gill
R. Bravo S. Chen R. De La O S. Singh
Media Preparation K. Ryan
P. Aguilera M. Conejo M. Cruz
Client Services/ Project Mgmt K. Aguilera
S. Anderson S. Hemmingson K. Horiuchi
SVOA M. Dangazyan
G. Gutierrez E. Ibarra Z. Wang
Gen Chem S. Anderson
GCMS W. Ang
S. Cao L. Cercado C. Cornett L. Hakobyan E. Moctezuma J. Rice C. Rosney S. Sommer
GC W. Henton
L. Keeler D. Munoz-Casteneda

KATHLEEN “KATE” AGUILERA
1989 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position	**CLIENT SERVICES MANAGER / PROJECT MANAGER** – 1997 to Present
Responsibilities	Responsibilities include interfacing with clients to provide technical project management and customer service, including project scheduling, tracking and consulting to determine appropriate sampling and analytical protocols. Coordinates with the laboratory and administration to ensure that analyses are properly executed and meets the clients’ needs.
Experience	**GC/MS Analytical Chemist,** *Columbia Analytical Services, Inc., DBA Performance Analytical Inc., Los Angeles, California,* 1994-1997. Analysis of air samples using EPA compendium methods TO-1, TO-2 and TO-14 using cryogenic concentration and thermal desorption techniques on whole air samples collected in summa canisters, Tedlar bags, and solid sorbent air samples. Proficient in the interpretation of mass spectra. Responsible for the preparation and quality control verification of solid sorbent sampling media for EPA Compendium methods TO-1 and TO-2.
	GC/MS Analytical Chemist, *Performance Analytical Inc., Canoga Park, California,* 1992-1994. Responsibilities listed above.
	GC Analytical Chemist, *Performance Analytical Inc., Canoga Park, California,* 1989-1992. Performed analyses of air samples for reduced sulfur compounds, hydrocarbon distribution and speciation, fixed atmospheric gases and total gaseous non-Methane organics. Performed analyses of soil and water samples for TPHg (mod. 8015) and BTEX. Performed extractions and analyses of CARB, NIOSH, OSHA and EPA 8000 series methods. Also performed metals analysis using flame and graphite furnace atomic absorption spectrophotometer (AA, GFAA).
Education	**BA, Chemistry,** *California State University – Northridge, California,* 1989
Affiliations	American Chemical Society

SUSAN "SUE" M. ANDERSON
2006 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position **PROJECT MANAGER / TECHNICAL MANAGER (GENERAL CHEMISTRY) -** 2006 to Present

Responsibilities Responsibilities include interfacing with clients to provide technical project management and customer service, including project scheduling, tracking and consulting to determine appropriate sampling and analytical protocols. Coordinates with the laboratory and administration to ensure that analyses are properly executed and meets the clients' needs. Also responsible for the training of general chemistry staff, maintenance of MDL studies and standard operating procedures, data evaluation and report responsibility.

Experience

Technical Manager, General Chemistry, *Columbia Analytical Services, Inc., Canoga Park, CA,* 2002-2006. In addition to the Project Manger duties listed below, also responsible for the management of General Chemistry laboratory operations, including the financial aspects. This includes supervision and coordination of work load and training personnel as necessary as well as supervision of method development and certification, method troubleshooting, and instrument maintenance. Also responsible for training staff, maintenance of MDL studies & SOPs, data evaluation and report responsibility. Other duties include participation in the formulation of project strategy and meetings involving major technical issues, working with regional senior management in short- and long-range planning, and other duties as assigned.

Project Manager II, *Columbia Analytical Services, Inc., Canoga Park, California,* 2000-2002. Responsibilities include interfacing with clients to provide technical project management and customer service, including project scheduling and tracking from the delivery of sample bottles to client site to the delivery of the completed analytical report. Ensures that the client receives timely, appropriate, and quality analytical services. Coordinates with the CAS laboratory and administration to ensure that analyses are properly executed and meet the clients' needs. Coordinates sub-contracting with internal and external laboratories. Acts as a liaison for all client-related activities within Columbia Analytical Services, Inc. Interfaces with word processing staff to answer technical questions that arise during EDD completion. Has high level role in data evaluation and report responsibility. High level client and regulatory agency contact.

Scientist I-III, *Columbia Analytical Services, Inc., Canoga Park, California,* 1992-2000. Responsible for performing inorganic analyses such as: alkalinity, ammonia, BOD, COD, cyanide, sulfide, reactivity, fluoride, pH, hardness, hexavalent chromium, phenols, surfactants, total-dissolved-suspended solid, conductivity, turbidity, nitrate, chloride by titration, turbidimetric sulfate, color, odor, organic lead, residual chlorine, settleable solids, specific gravity, carbon dioxide, TCLP/STLC metals and semi-volatile extraction. Also perform analyses for TRPH and oil and grease and occasionally perform metals digestion. Also ran the Graphite furnace for all furnace metals and was responsible for standard prep and maintenance.

Wet Chemist, *National Environmental Testing, Bartlett, Illinois,* 1990-1991. Responsible for the analyses for wastewater parameters and some inorganic analytes.

Education **BS, Biochemistry,** *University of Illinois, Urbana-Champaign, Illinois,* 1989.

WIDAYATI "WIDA" ANG

2007 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position	**VOLATILE GC/MS TEAM LEADER -** 2008 to Present
Responsibilities	Team leader for the Volatile Gas Chromatography Mass Spectrometry Air group responsibilities are but are not limited to training of chemists, peer review of analytical data, mentoring of junior analysts, standard operating procedure review and streamlining of methods. Duties also require performance reviews and development of her direct reports. **Documentation of Demonstration of Capabilities is available for review.**
Experience	**GC/MS CHEMIST,** *Columbia Analytical Services, Inc., Simi Valley, CA. 2007-2008.* Analyzing indoor air, ambient air and source emission samples by GC/MS methods, standard preparation, perform maintenance on instruments when required, real time data reduction, participate in peer review process, and good practice of all QA/QC requirements. **Technical Manager, Organic Chemistry,** *Columbia Analytical Services, Inc., Canoga Park, CA, 1999-2007.* Responsible for managing the organics department with regards to State and Federal regulatory requirements. Supervises and coordinates work load and trained personnel. Supervised method development and certification, as well as method troubleshooting and instrument maintenance. Responsible for mobile laboratory operations. **Data Validation,** *Laboratory Data Consultants, Inc., Carlsbad, CA 1998-1999.* Responsible for retrieving analytical data from closed down labotarory operations , review and validation of data packages. Supervised other employees for data package assembly. **Assistant Quality Control Manager & Data Package Specialist**, *VOC Laboratories, Inc., Glendale, CA,* 1996-1998. Responsible for overseeing data quality of final data validation packages. Managed production of data packages to meet various State and Federal analytical programs as well as customized client formats. Oversaw enforcement of the laboratory for implementation of corrective action measure. Interacted with chemists and project managers to ensure accuracy and completeness of data deliverables. **Technical Director and Department Manager**, *Thermo Analytical, Monrovia, CA,* 1992-1996. Responsible for daily operations of the organic chemistry department. Developed standard operating procedures for various methods. Reviewed analytical data generated for completeness and contractual requirements according to Contract Laboratory Program (CLP) and SW-846 methods. Organized and scheduled reports for project managers. Responsible for upgrading and purchasing new instrumentation. Provided technical support to QC coordinator and laboratory personnel. Assisted with proposal preparation and audits. **Department Supervisor & Chemist**, *Thermo Analytical, Monrovia, CA,* 1988-1992. Responsible for training chemist and technicians in proper performance of various analytical methods. Ensured that data produced by chemists was in compliance with standard operating procedures and contractual requirements. Responsible for sample analysis of water, soil and air for volatile organics by GC and GC/MS. Assisted chemists in the analysis and interpretation of pesticides and PCBs. **Analytical Chemist**, *Shankman Laboratories, Los Angeles, CA,* 1986-1988. Prepared and analyzed soil and water samples using GC, GC/MS, HPLC, IR, IC and UV spectrophotometic techniques.
Education	**BS, Chemistry,** *Technical University of West Berlin, Germany,* 1982. **MS, Chemistry,** *Technical Un*iversity of West Berlin, Germany, 1984.

RUSTICO "RUSTY" BRAVO

2004 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position

Data Validation Coordinator – 2009 to Present

Responsibilities

Responsibilities include validation of analytical results produced by the laboratory. Verification of client analytical requests, sample information, and reporting formats. Interacts with project managers and Quality Assurance Program Manager to ensure that all reports fulfill client requirements as well as QA/QC needs. Compiled quality control summary, and calibration data upon client request for data packages.

Experience

GC/MS Chemist, *Columbia Analytical Services, Inc., Simi Valley, CA,* 2004-2009. Analyzing indoor air, ambient air and source emission samples by GC/MS methods, standard preparation, perform maintenance on instruments when required, real time data reduction, participate in peer review process, and good practice of all QA/QC requirements.

Chemist, *FGL Environmental, Santa Paula, CA,* 1995-2004. Primary operator of HP ICP/MS and Thermo ICP/MS; backup operator of TJA Trace ICP/AES and Leeman P5200; senior chemist of the Metals Department, supervising trace operator and sample prep technician; maintained and troubleshoot instrumentation and methodologies.

Chemist, *Pace, Inc., Camarillo, CA,* 1992-1995. Primary operator of Varian AA and GFAA, and of Leeman PS200 Hg analyzer; backup operator of TJA Trace ICP/AES; sample prep of CARB and BIF trains.

Education

BS, Chemistry, *University of Santo Tomas, Manila, Philippines,* 1986.

SIMON CAO
2007 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position **GC/MS CHEMIST**– 2007 to Present

Responsibilities Analyzing indoor air, ambient air and source emission samples by GC/MS methods, standard preparation, perform maintenance on instruments when required, real time data reduction, participate in peer review process, and good practice of all QA/QC requirements.

Documentation of Demonstration of Capabilities is available for review.

Experience

SVOA Chemist, *Columbia Analytical Services, Canoga Park, CA.* 2004-2006. Responsible for the analyses of base/acid/neutral (BNA) by EPA Method 8270C and low-level polyaromatic hydrocarbons (PAH) by EPA Method 8270C-SIM. Perform data reduction, data review, and reporting. In addition, also responsible for routine instrument maintenance and troubleshooting.

Inorganics Supervisor, *American Analytics, Chatsworth, CA. 2000-2004.* Supervised wet chemistry and metals departments; responsible for the daily operation of sample analyses and the quality of report generation. Methods in wet chemistry department included analytical techniques such as ion selective electrodes, colorimetric, photometric, and gravimetric. Metals analyses were performed on ICP, CVAA, and GFAA. Also responsible for instrument maintenance, troubleshooting, and the training of new chemists.

Analyst III, *Columbia Analytical Services, Canoga Park, CA. 1993-1999*. Responsible for the extraction of environmental samples, both aqueous and soil matrixes, for diesels, pesticides/PCB, BNA, and volatile analyses by GC and GC/MS. Performed diesel analysis by EPA Method 8015B and gasoline/BTEX analysis by EPA Methods 8015B/8021.

Education **BS, Pharmaceutical Science,** *First Medical College of Shanghai, China.* 1976.

LLESENIA CERCADO

2000 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position

GC/MS CHEMIST – 2011 to Present

Responsibilities

Analyzing indoor air, ambient air and source emission samples by GC/MS methods, standard preparation, perform maintenance on instruments when required, real time data reduction, participate in peer review process, and good practice of all QA/QC requirements.

Documentation of Demonstration of Capabilities is available for review.

Experience

TEAM LEADER (CANISTER CONDITIONING, SHIPPING), *Columbia Analytical Services, Inc., Simi Valley, CA,* 2006-2011. Responsibilities include waste disposal, canister conditioning and preparation, fulfillment of media requests; shipping and occasionally receiving samples. Additional responsibilities include training within the department, of flow controller and critical orifice calibration and checks, sampling media inventory and pressure/vacuum gauge inventory and calibration checks between annual metrology calibrations.

Technician, *Columbia Analytical Services, Inc., Simi Valley, CA,* 2003-2006. Responsibilities include waste disposal, canister conditioning and preparation, fulfillment of media requests; shipping and occasionally receiving samples. Additional responsibilities include training within the department, of flow controller and critical orifice calibration and checks, sampling media inventory and pressure/vacuum gauge inventory and calibration checks between annual metrology calibrations.

Analyst II, *Columbia Analytical Services, Inc., DBA Performance Analytical, Inc., Los Angeles, California,* 2000-2003. Responsibilities include preparation of samples using Soxhlet, shakeout and sonication extraction. Preparation of indoor air and industrial hygiene samples using solvent desorption. Gas Chromatographic screening of samples collected in Tedlar bags and summa canisters for volatile organic compounds

Education

AS, Chemical Technology, *Los Angeles Trade Technical College, Los Angeles, California,* 2004.

CERTIFICATE, Chemical Technology, *Los Angeles Trade Technical College, Los Angeles, California,* 2000.

KU-JIH CHEN

1989 TO PRESENT

Columbia Analytical Services

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position	**Principle Chemist** – 2000 to Present
Responsibilities	Responsible for the development and validation of new sampling and analysis methods, new technology and laboratory automation.
Experience	**Scientist VII,** *Columbia Analytical Services, Inc., DBA Performance Analytical, Inc., Los Angeles, California,* 1994-2000. Responsibilities included operating the Gas Chromatography and Sample Preparation Laboratories, developing methods (previously developed the Total Combustion Analyzer for the measurement of reactive organic gases in stationary source samples, and the Determination of Reduced Sulfur Compounds and fixed atmospheric gases in POTW emissions, refinery and landfill gases), and serving as the laboratory's primary Industrial Hygiene Chemist.
	Principal Chemist, *Performance Analytical, Inc., Canoga Park, California,* 1989-1994. Responsibilities listed above.
	Extraction Laboratory Supervisor, *C-E Environmental Inc., Camarillo, CA,* 1984-1989. Responsibilities included supervising chemists, associate chemists, and technicians, preparing SOP's, analytical standards, and spiking solutions, serving as Primary Extraction Chemist for the Love Canal Habitability Study, and previously responsible for instrumental analysis using GC, LC, GC/MS, and AA.
	Research & Development Chemist, *Paolyta Company, Taipei, Taiwan*, 1980-1984.
	Research Chemist, *Panlabs Taiwan Ltd., Taipei, Taiwan*, 1975-1980.
Education	**BS, Botany,** *National Chung-Hsing University, Taipei, Taiwan.*

CHRIS CORNETT

2007 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position	**GC/MS CHEMIST** – 2009 to Present
Responsibilities	Analyzing indoor air, ambient air and source emission samples by GC/MS methods, standard preparation, perform maintenance on instruments when required, real time data reduction, participate in peer review process, and good practice of all QA/QC requirements. **Documentation of Demonstration of Capabilities is available for review.**
Experience	**GC Chemist,** *Columbia Analytical Services, Inc., Simi Valley, CA*, 2007-2009. Analysis of vapor phase and liquid samples for various volatile compounds, perform maintenance on instruments when required, real time data reduction, participate in peer review process, maintain working knowledge of all GC methods performed in laboratory, and good practice of all QA/QC requirements. **Research Intern**, *Act 1, Thousand Oaks, CA*, 2006-2007. Developed procedures and SOPs for a new ultrasonic velocimetry machine in the formulations department. Use of stat-of-the-art technology like circular dichroism, FT-IT, differential scanning calorimetric and rheometry to establish the sensitivity and efficacy of ultrasonic velocimetry. **Graduate Student Scientist**, *CSUCI Alzheimer's Institute, Camarillo, CA*, 2006-2007. Conduct drug discovery research by chemically conditioning natural extracts and creating novel lead-like small molecules for the treatment of Alzheimer's disease. Involved in establishing potential pharmaceutically active fractionates and performing structural analyses on the products. Utilizing techniques such as thin layer chromatography, gravity column chromatography and a 500 MHz nuclear magnetic resonance machine.
Education	**MS, Biotechnology,** *California State University, Channel Islands, Camarillo, CA*, 2007. **BS, Biology**, *University of California, Los Angeles, CA*, 2003.

MADELEINE DANGAZYAN

1999 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position

SEMI-VOLATILES TEAM LEADER – 2002 to Present

Responsibilities

Team leader for the Semi-Volatile group responsibilities are but not limited to training of chemists, peer review of analytical data, mentoring of junior analysts, standard operating procedure review and streamlining of methods. Duties also require performance reviews and development of direct reports. Additional responsibilities are analyzing ambient air, source emissions, and industrial hygiene samples using GC and HPLC. Preparation and analysis of air samples taken on various sorbent tubes for semi-volatile organic compounds. Determination of Carbonyls, Phenols and Cresols in ambient air and source emission samples using HPLC. Routine and necessary instrument maintenance.

Documentation of Demonstration of Capabilities is available for review.

Experience

SVOA Chemist, *Columbia Analytical Services, Inc., Simi Valley, CA,* 1999-2002. Responsibilities included training of chemists, peer review of analytical data, mentoring of junior analysts, standard operating procedure review and streamlining of methods. Additional responsibilities are analyzing ambient air, source emissions, and industrial hygiene samples using GC and HPLC. Preparation and analysis of air samples taken on various sorbent tubes for semi-volatile organic compounds. Determination of Carbonyls, Phenols and Cresols in ambient air and source emission samples using HPLC. Routine and necessary instrument maintenance.

Analytical Chemist, *Air Products and Chemicals, Inc., Long Beach, California,* 1995-1999. Quality assurance analysis of EPA protocol gases utilizing GC, FTIR and NDIR. Preparation of personnel schedules, lead laboratory contact.

Undergraduate Research, *California State University at Northridge, Northridge, California,* 1993-1994. Assisted professor with improving and implementing student laboratory experiments to better utilize a GC/MS.

Education

BS, Chemistry, *California State University Northridge, California,* 1995.

ROBERT DE LA O
1990 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position
Systems Analyst / Information Technology – 1995 to Present

Responsibilities
Responsible for generating reports, automating routine work and maintaining databases, electronic data archiving, e-mail functions. Also responsible for client spreadsheets and disk deliverables and computer maintenance/upgrades, generation and submission of client electronic data deliverables. Additional responsibilities where necessary include maintaining local laboratory network systems. Performing necessary systems maintenance, upgrades, and replacements to provide reliable network operations for the acquisition and reporting of analytical data. Assist local lab personnel with IT needs and troubleshoot hardware and software problems when they occur. Manage electronic data archiving/restoration operations. Assist Corporate IT with integration of WAN projects and applications into local operations.

Experience
Administrator III, *Columbia Analytical Services, Inc., DBA Performance Analytical, Inc., Los Angeles, California,* 1990-1995. Responsible for logging samples in, generating reports and invoicing. Shipping and Receiving.

Assistant Manager, *May Company, North Hollywood, California,* 1990. Responsibilities included: employee scheduling, inventory control and making sure items were well stocked and clearly priced.

Assistant Manager, *Sears Roebuck and Company, North Hollywood, California,* 1985-1990. Supervised 10 Departments (approximately 50 employees). Responsibilities included: employee scheduling, hiring, customer service/complaints, and assisting with opening and closing the store daily.

Education
COURSEWORK, Computer Science, *Moorpark College, Moorpark, California,* 1999 - 2003
COURSEWORK, Business and Computer Science, *Los Angeles Valley College, Van Nuys, California,* 1990-1998.
COURSEWORK, Business and Computer Science, *California State University, Northridge, California, 1987-1990.*

ALYSON H. FORTUNE

2006 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position

Air Quality Scientist– 2006 to Present

Responsibilities

Act as a local technical & project management resource for Columbia Analytical's East coast clients. Provide technical sampling/analytical information, cost quotation, and responses to RFPs. Visit local clients and offer technical "Brownbag" presentations for local offices. Attend national conferences on relevant air sampling topics, present technical papers, coordinate exhibit booths, and otherwise increase the laboratory's presence at conferences. Working with laboratory staff, coordinate and conduct research projects on relevant topics to present at technical conferences. Track potential future analytical needs of our clients, along with industry trends.

Experience

Technical Director, *ENSR Air Laboratory, Harvard/Westford, MA,* 2002-2006. Responsible for daily operations of GC and GC/MS, equipment maintenance, maintaining laboratory NELAC certifications, overseeing quality systems, and overseeing health and safety system in the Harvard, MA facility. Also responsible for marketing/business development, general client relations, and report and invoice generation.

Staff Specialist, *ENSR, Harvard/Westford, MA,* 1998-2002. Performed many laboratory, field, and project related duties, including: data validation, project chemist/laboratory coordination duties, assisting with proposal generation, onsite GC analysis of air samples, laboratory GC/FID, GC/FPD, and GC/MS analysis of whole air (Summa canister, tedlar bag), sorbent tube, and groundwater samples.

Education

MS, Environmental Science-Atmospheric Science, *University of Massachusetts, Lowell, MA,* 2004.
BS, Environmental Science-Chemistry & Toxicology, *University of Massachusetts, Amherst, MA*, 1998.
Short Courses in GC/MS and Mass Spectral Interpretation (Agilent), OSHA HAZWOPER 40hr Training

Publications/ Presentations

Mrs. Fortune has a number of publications and presentations. Select publications/presentations are listed below. For a complete list, please contact CAS.

Fortune, Alyson H. "Sampling and Analyzing Odorous Chemicals". Invited speaker at the Bay Area Air Quality Management District (BAAQMD) Odor Evaluation Technical Conference, August 2010.

Fortune, Alyson H, Granholm, Peter, Schuver, Henry, and Ujjani, Bharti. "Vapor Intrusion Investigation and Mitigation: Advances in Assessment and Practice". Co-Instructor for 8-hour Professional Development Course at AIHA Annual Conference (AIHce), May 2010.

Fortune, Alyson H. and Tuday, Michael. "Comparison of Sampling & Analytical Techniques for Hydrogen Sulfide". Oral Presentation at the WEF Odors and Air Pollutants 2010 Conference, March 2010.

Fortune, Alyson H, Gendron, Leo and Tuday, Michael. "Comparison of Naphthalene Ambient Air Sampling & Analysis Methods at a Former Manufactured Gas Plant Site". International Journal of Soil, Sediment, and Water. Volume 3, Issue 1, 2009.

Fortune, Alyson H. "Comparison of Sampling & Analytical Methods for Total Volatile Organic Compounds (TVOC) in Green Buildings". Oral Presentation at the Florida Brownfields Conference, November 2009.

Chen, K., Cherazaie, H., Cornett, C., Dangazyan, M., Fortune, A., Henton, W., Parnell, C., and Tuday, M. "Measurement of Corrosive, Odorous and Potentially Harmful Gases from Imported and Domestic Wallboard". Oral Presentation by M. Tuday at the Technical Symposium on Corrosive Imported Drywall, November 2009.

Fortune, Alyson H. and Tuday, Michael. "Indoor Air Quality Assessment and Measurement". Co-author of Oral Presentation by M. Tuday in the "Green Building Practices: Canada and the U.S." ThinkShop at the Professional Conference on Industrial Hygiene (PCIH), October 2009.

Fortune, Alyson H. and Tuday, Michael. "The Importance of Air Sampling Media Cleanliness for Vapor Intrusion Investigations". Oral Presentation at the Environmental Measurement Symposium, August 2008.

Fortune, Alyson H. and Tuday, Michael. "Stability of Ultra Low Level VOCs Under Real World Conditions". Oral Presentation at AWMA Symposium on Air Quality Measurement Methods and Technology, May 2007.

Affiliations

American Industrial Hygiene Association
Air & Waste Management Association
Society for Women Environmental Professionals

ROBIN GILL
1991 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position

DATA VALIDATION COORDINATOR AND TEAM LEADER – 2002 to Present

Responsibilities

Team leader responsibilities are evaluation and approval of work shifts, vacation requests, training and mentoring new data validation team members, in addition to yearly performance reviews to evaluate job achievements. Data validation responsibilities are for data review and validation as well as data package compilation, job tracking, archiving and the production of laboratory reports. Interacts with project managers and Quality Assurance Program Manager to ensure that all reports fulfill client requirements as well as QA/QC needs. Also serves as a backup for case narrative generation and manages the turn around times so that reports are distributed to the clients in a timely manner.

Experience

Project Manager III, Quality Control Coordinator, *Columbia Analytical Services, Inc., DBA Performance Analytical, Inc., Los Angeles, California,* 1994-2002. Responsibilities listed above.

Project Manager III, Quality Control Coordinator, *Performance Analytical Services, Inc., Canoga Park, California,* 1991-1994. Primarily responsible for data review and validation as well as data package compilation. Also responsible for job tracking, archiving and the production of laboratory reports.

Data Group Supervisor, *ABB Environmental, Camarillo, California,* 1980-1991. Supervised five employees in the Data Group Department. Responsible for data review and validation, document control, data package compilation, job tracking and archiving, and the organization and prioritization of workload.

GILBERT GUTIERREZ
2006 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position	**EXTRACTION TECHNICIAN** – 2006 to Present
Responsibilities	Responsibilities include preparation of samples using Soxhlet, shakeout, and sonication extraction using EPA methods such as TO-13A, TO-4A, TO-10A. Preparation of indoor air and industrial hygiene samples using solvent desorption.
	Documentation of Demonstration of Capabilities is available for review.
Experience	*FGL Environmental, Santa Cruz,* 1995 – 2006. Maintaining the full operation of the organic extraction lab including ordering and maintaining solvents, glassware and instruments. Also performed extraction of drinking water, waste water, and soils.

LUSINE HAKOBYAN
2008 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position	**GC/MS CHEMIST** – 2008 to Present
Responsibilities	Analyzing indoor air, ambient air and source emission samples by GC/MS methods, standard preparation, perform maintenance on instruments when required, real time data reduction, participate in peer review process, and good practice of all QA/QC requirements.
	Documentation of Demonstration of Capabilities is available for review.
Experience	**Chemist**, *Calscience, Garden Grove, California*, 2001-06. Responsible for specimen analysis, compilation of test results, data entry of test information, and preparation of reports and other lab-related functions in the Volatile Organics Department.
Education	**BS, Criminal Justice,** University of Phoenix, 2011
	COURSEWORK, Chemistry, Glendale Community College, Glendale, CA. 1999-2001

SAMANTHA L. HENNINGSEN

2010 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position	**PROJECT MANAGER II** – 2010 to Present
Responsibilities	Responsibilities include interfacing with clients to provide technical project management and customer service, including project scheduling, tracking, and consulting to determine appropriate sampling and analytical protocols. Coordinates with the laboratory and administration to ensure that analyses are properly executed and meets the clients' needs. Responsibilities also include overseeing all "non-routine" projects, as well as coordinating and directing internal laboratory research and method development.
Experience	**Biofuels Research Assistant**, *University of Nevada, Reno, NV.*, 2009-2010. Studied a wide variety of feasibility parameters of the microalgae Duneliella salina such as overall energy content and density, novel extraction methods, separation systems, mass transfer limitations, and recycling systems of excess carbon dioxide and residual biomass.
Education	**BS, Chemical Engineering**, *University of Nevada, Reno, Nevada.*, 2010.

WADE H. HENTON
1994 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position

VOLATILE GC TEAM LEADER – 2000 to Present

Responsibilities

Team leader for the Volatile Gas Chromatography department where responsibilities include but not limited to training of chemists, peer review of analytical data, mentoring of junior analysts, standard operating procedure review and streamlining of methods. Duties also require performance reviews and development of his direct reports.

Documentation of Demonstration of Capabilities is available for review.

Experience

Scientist V, *Columbia Analytical Services, Inc., DBA Performance Analytical, Inc., Los Angeles, California,* 1995-2000. Responsibilities include analyzing indoor and ambient air, source emission, and industrial hygiene samples by GC and GC/MS methods.

Scientist IV, *Columbia Analytical Services, Inc., DBA Performance Analytical, Inc., Los Angeles, California,* 1994-1995. Responsibilities listed above.

Analytical Chemist, *Coast to Coast Analytical Services, Camarillo, California,* 1992-1994. Responsibilities included analyzing samples using EPA methods 625, 525 and 1625 as well as developing new methods for GC/MS testing.

Analytical Chemist, *Coast to Coast Analytical Services, Goleta, California,* 1991-1992. Responsibilities included analyzing samples using EPA methods 624 and 524.2 by GC/MS. Used GC/MS methods to perform fuel fingerprinting.

Analytical Chemist, *Combustion Engineering Environmental, Inc., Camarillo, California*, 1986-1991. Responsibilities included method development for GC and HPLC. Analysis of samples using EPA methods 608, 615, 631, 632 and SW846. Other methods used include 8080, 8010, 8020, 8150 and 8030. Oversaw data integrity for the GC Laboratory instrument data network. Data review.

Chemist, *Fortin Industries, Sylmar, California,* 1986. Research and Development and Quality Assurance/Quality Control on polymer products and metal coatings using differential scanning calorimeters, scanning electron microscope, AA, GC, and HPLC.

Education

BS, Chemistry, *University of California Santa Barbara, California,* 1985.

KELLY M. HORIUCHI

2003 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position

LABORATORY DIRECTOR / PROJECT MANAGER – 2009 to Present

Responsibilities

Responsibilities include managing technical operations, employee development and business operations (financial and marketing). Additionally responsible for ensuring that quality control functions are carried out as planned and to guarantee the production of high quality data. The Laboratory Operations Manager is also required to coordinate laboratory work shifts, perform work reviews, schedule programs such as method detection limit studies and training, review corrective action reports, and coordinate sample analysis scheduling with respect to holding times and client requirements. Additionally works with the Project Managers on scheduling conflicting client projects and the Quality Assurance Program Manager on certain quality issues as they directly relate to the laboratory.

Experience

Project Manager, *Columbia Analytical Services, Inc., Simi Valley, CA, 2005-2009.* Responsibilities include interfacing with clients to provide technical project management and customer service, including project scheduling, tracking and consulting to determine appropriate sampling and analytical protocols. Coordinates with the laboratory and administration to ensure that analyses are properly executed and meets the client's needs.

Data Validation Coordinator, *Columbia Analytical Services, Inc., Simi Valley, CA***,** 2003-2005**.** Responsibilities included validation of analytical results produced by the laboratory. Verification of client analytical requests, sample information, and reporting formats. Interacts with project managers and Quality Assurance Program Manager to ensure that all reports fulfill client requirements as well as QA/QC needs. Compiled quality control summary, and calibration data upon client request for data packages. Assist the Quality Assurance Program Manager with standard operating procedures, control charting, and audit preparation.

Database Analyst, *Cure Autism Now (Autism Genetic Resource Exchange), Los Angeles, California,* 2002-2003. Performed analysis of test date through data audits and queries, maintained extensive database, and coordinated data audits between Northern and Southern California locations. Additional duties included assisting in the creation of new databases, as needed, creation of SOP for phenotypic and genotypic data collecting, and process improvements for subject flow through the research project.

Scientist II, Data Validation Coordinator, *Columbia Analytical Services, Inc., DBA Performance Analytical, Inc., Simi Valley, California,* 2000-2002. Responsibilities included validation of all analytical results produced by the laboratory. Verification of client analyses, sample information, and reporting format. Compiled quality control summary, and calibration data upon client request for data packages. Assisted the Quality Assurance Program Manager with standard operating procedures, control charting, and audit preparation.

Administrative Assistant/Data Analyst, *Specialty Laboratories, Santa Monica, California,* 1999-2000. Performed retrieval, quality control, and organization of data. Compiled data for reporting of HIV, lead, urinalysis, kidney stones, and communicable diseases. Also communicated with the state DOH and clients regarding reporting requirements and demographic information.

Administrative Assistant, *Horvitz & Levy LLP, Encino, California,* 1991-1999. Report new cases to attorneys, check clients through conflict database, QC party information, maintain attorney calendars, and perform orientations of new attorneys.

Education

BA, Biology, *California State University Northridge, California,* 1998.

CHANEY HUMPHREY
2005 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position — **QUALITY ASSURANCE PROGRAM MANAGER** – 2009 to Present

Responsibilities — Responsibilities include facilitate ethics and QA training, maintain all training documentation, perform QA orientation for new employees, review data (both hardcopy and electronic), perform internal QA audits and prepare written reports, review, approve, and control Standard Operating Procedures, maintain QA Manual, maintain QA records (including archived logbooks, archived certificates of analysis, nonconformity and corrective action reports, MDL studies results, SOP revision and distribution, statistical control limits, PE sample results), serve as document control officer, and PC for all PE sample analyses, prepare corrective action report for any unacceptable PE sample results, maintain laboratory's certifications and approvals, facilitator for external QA audits and prepare written response to deficiencies, prepare activity report to management.

Experience

Data Validation Coordinator, *Columbia Analytical Services, Inc. Simi Valley, California*, 2007-2009. Responsibilities include validation of analytical results produced by the laboratory. Verification of client analytical requests, sample information, and reporting formats. Interacts with project managers and Quality Assurance Program Manager to ensure that all reports fulfill client requirements as well as QA/QC needs. Compiled quality control summary, and calibration data upon client request for data packages.

GC/MS Chemist, *Columbia Analytical Services, Inc. Simi Valley, California*, 2005-2007. Analyzing indoor air, ambient air and source emission samples by GC/MS methods, standard preparation, perform maintenance on instruments when required, real time data reduction, participate in peer review process, and good practice of all QA/QC requirements.

Analyst I, *Columbia Analytical Service, Inc. Kelso, Washington,* 2004-2005. Performed a variety of analytical tests within the General Chemistry laboratory according to EPA Methodologies including Ion Chromatography, total sulfur, and solids. Saturday crew member responsible for performance of all short hold time methods including microbiology methodologies.

2002-2004. Temporary employee (summers) performing a variety of analytical tests including grain size, total organic carbon, total suspended solids, total dissolved solids, alkalinity, acidity, and chemical oxygen demand. Additionally, performed colorimetric methods including ortho-phosphorous, total-phosphorous, hexavalent chromium, and nitrite as nitrogen.

Toxicology Risk Assessment Procedure (ToxRap) Assistant, *Environmental Health Sciences Center, Oregon State University, 2001-2003.* Developed curriculum alignment for K-12 state benchmarks. Prepared workshop materials for K-12 grade teachers. Assisted in workshop presentations.

Education — **BS, Biology,** *Oregon State University, Corvallis, Oregon,* 2004

LAURYN KEELER
2010 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position	**GC CHEMIST** – 2010 to Present
Responsibilities	Analysis of vapor phase and liquid samples for various volatile compounds, perform maintenance on instruments when required, real time data reduction, participate in peer review process, maintain working knowledge of all GC methods performed in laboratory, and good practice of all QA/QC requirements. **Documentation of Demonstration of Capabilities is available for review.**
Experience	**Research Assistant,** *Department of Chemistry and Biochemistry, University of California Santa Barbara, 2007-2009.* Conducted research related to the study of aggregation of human tau protein to amyloid fibers. Research activities included physical analysis of aggregation process and aggregates using TEM, NMR, ESR and turbidity measurements by UV detection and other tools.
Education	**BS, Chemistry**, *University of California, Santa Barbara, CA,* 2010.

ELSA MOCTEZUMA
2007 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position	**GC/MS CHEMIST** – 2007 to Present
Responsibilities	Analyzing indoor air, ambient air and source emission samples by GC/MS methods, standard preparation, perform maintenance on instruments when required, real time data reduction, participate in peer review process, and good practice of all QA/QC requirements. **Documentation of Demonstration of Capabilities is available for review.**
Experience	**Environmental Analysis I,** *BC Laboratories, Bakersfield, CA* 2005-2007. Performed departmental EPA tests using Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES, ICP-OEMS). Ensured compliance with QC requirements, routine instrument maintenance and alignment, documenting both. Wrote technical reports including summary of data. Responsible of Method detection Limit (MDL), Linear Range, Instrument Detection Limit (IDL), (IEC).
Education	**BS, Chemistry,** *University of California, Santa Barbara, CA,* 2005.

DANTE A. MUÑOZ-CASTAÑEDA

2010 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position	**Analyst III** – 2010 to Present
Responsibilities	Analysis of vapor phase and liquid samples for various volatile compounds using established SOPs, perform maintenance on instruments when required, real time data reduction, participate in peer review process, maintain working knowledge of all GC methods performed in laboratory, and good practice of all QA/QC requirements. **Documentation of Demonstration of Capabilities is available for review.**
Experience	**Undergraduate Researcher**, *UC Santa Barbara EEMB Department, Santa Barbara, CA.*, 2006. Designed primers form cDNA, amplified Opsin gene fragments using RT-PCR, cloned gene fragments in-vivo and sequenced gene fragments.
Education	**BS Chemistry**, *University of California- Santa Barbara, Santa Barbara, CA.*, 2009.
Publications/ Presentations	**SACNAS Conference 2006** Poster Presenter *Tampa, Fl* **CAMP Conference 2007** Poster Presenter *Irvine, CA*

NICK NASH
2007 TO PRESENT

Columbia Analytical Services

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position	**QUALITY ASSURANCE ASSISTANT** – 2007 to Present
Responsibilities	Responsibilities include assisting with organizing QA training and compiling all training documentation, perform certain internal QA systems audits and prepare written reports, organizing and filing QA records (including archived logbooks, archived certificates of analysis, nonconformity and corrective action reports, MDL studies results, SOP revision and distribution, statistical control limits, PE sample results), serve as document control officer. Additional responsibilities at the discretion of the QA Program Manager.
Experience	**Quality Assurance / Quality Control,** *Mitsubishi Silicon of America, Salem, Oregon,* 2000-2001. Responsibilities included operating clean room equipment (Visual Inspection, Clean Sink, WIS CR-80, and Packaging) of the final stage in the silicon wafer manufacturing process. Monitored and obtained particle counts down to 0.2 µm in various locations of the different clean room environments throughout the plant and produced spreadsheets with charts twice-weekly showing recent trends. Performed weekly audits on finished packaged goods for quality issues.
Education	**AS, Human Resources Management,** *College of the Canyons, Valencia, California, 2010*.

CHRISTOPHER J. PARNELL

1991 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position **TECHNICAL ADVISOR (VOLATILE GC/MS AIR)** – 2008 to Present

Responsibilities Technical Advisor for the Volatile Gas Chromatography Mass Spectrometry department. Has the responsibility of oversight of training of chemists, peer review of analytical data, mentoring of junior analysts, standard operating procedure review and streamlining of methods. Duties also require performance reviews and development of his direct report.

Documentation of Demonstration of Capabilities is available for review.

Experience

GC/MS Team Leader, *Columbia Analytical Services, Inc.,* 2000-2008. Team leader for the Volatile Gas Chromatography Mass Spectrometry group responsibilities are but are not limited to training of chemists, peer review of analytical data, mentoring of junior analysts, standard operating procedure review and streamlining of methods. Duties also require performance reviews and development of his direct reports.

Scientist VI, *Columbia Analytical Services, Inc., DBA Performance Analytical, Inc., Los Angeles, California,* 1994-2002. Responsibilities include analyzing indoor air, ambient air and source emission samples by GC/MS methods, standards preparation, perform maintenance on instruments when required, real time data reduction, participation in peer review process, and good practice of all QA/QC requirements.

Scientist VI, *Performance Analytical, Inc, Canoga Park, California,* 1991-1994. Responsibilities listed above.

Air Toxics Laboratory Supervisor, *ABB Environmental Inc., Camarillo, California,* 1990-1991. Responsibilities included scheduling client analyses and developing methods for non-routine analyses, and operating the Air Toxics laboratory.

Analytical Chemist, *C-E Environmental Inc., EMSI, Camarillo, California,* 1987-1990. Responsibilities included overseeing the Pesticide/PCB analysis of samples under the EPA Contract Laboratory Program, and interfacing with the EPA and regional offices to respond to inquiries and performing GC analyses and extractions.

Chemist, *Damon Reference Laboratory, Newbury Park, California,* 1986-1987. Responsibilities included performing Enzyme-linked immunosorbent assays, Western-Blot assays, and Protein Electrophoresis.

Education **BS, Chemistry,** *University of California, Santa Barbara, California,* 1986.

JOHN RICE
2011 TO PRESENT

Columbia Analytical Services

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position **GC/MS CHEMIST** – 2011 to Present

Responsibilities Analyzing indoor air, ambient air and source emission samples by GC/MS methods, standard preparation, perform maintenance on instruments when required, real time data reduction, participate in peer review process, and good practice of all QA/QC requirements.

Documentation of Demonstration of Capabilities is available for review.

Experience

Sr Chemical /Safety Engineer / Consultant, *Electronic Sensor Technology, Newbury Park, CA* 2005-2011. Provided setup training of Ultra-fast GC headspace analysis equipment. Handled customer service inquires and provided solutions. Developed and executed QC testing for production and completed Ultra-fast GC systems. Supervised laboratory functions including sample testing, chemical prep, standard prep and complete maintenance of equipment. Oversaw testing of samples using TRACE ULTRA-DSQII GC-MS. Created health and safety manual and conducted routine safety training for employees.

Quality Assurance Supervisor, *VOPAK, San Pedro, CA 2003-2005*. Performed laboratory testing including GC, UV/VIS, Karl-Fischer water, colorimetry, viscosity, titrations, and various other tests. Created instrument calibration schedule for testing of FDA regulated products. Revised documentation including method development, SOPs, calibration and training schedules, and waste recycling guidelines. Developed in-house testing methods, based on ASTM Standards, for all new products. Also implemented an enhanced waste recycling plan.

Chemist, *Herbalife, Torrance, CA,* 2002-2003. Analyzed products using a wide variety of analytical techniques including HPLC, Karl-Fischer Titrations, and various wet chemistry applications. Developed and implemented projects such as employee training, safety programs and involved with revising SOPs. Shared job duties such as data trending, calibration of instruments, and cross-training. Assisted formulators in modifying and revising label claims based on QA testing and analysis.

Research Engineer, ULTRAMET, Pacoima*, CA,* 2001-2002. Coordinated a Phase II SBIR project involving the fabrication of carbon-based nanomaterials to be used as electrodes for capacitors, resulting in increased power performance. Aided in an effort to recycle tantalum and rhenium metal from waste stream processes. Performed research and development specifically to design and synthesize new materials. Recognized material microstructure-property relationships and identified applications for these materials. Worked to improve the synthesis, purification, and utilization of foam materials, carbon-based and ceramic based nanomaterials. Responsible for periodic progress report to management, sponsors, and to colleagues at technical conferences.

Quality Control Scientist, BACHEM*, Torrance, CA,* 1999-2001. Tested peptides using HPLC methods while maintaining compliance of c-GMP operating procedures to ensure products passed specifications set forth by the FDA. Analyzed products using a wide variety of analytical techniques including HPLC, GC, GCMS, UV/VIS spectrophotometry, polarimetry and various WET chemistry applications. Performed environmental monitoring and testing of the clean room and USP water system. Assisted in developing in-house clean room bacteria I.D. tests.

Production Chemist, BACHEM*, Torrance, CA,* 1998-1999. Performed peptide synthesis using instrumentation such as kilo-prep HPLC, analytical HPLC, lyophilization, and methods such as buffer preparation, acidolysis cleavage of peptide resin, general technical laboratory responsibilities, while maintaining and reviewing all logbooks and batch production documentation. Assisted in enhancing the development of production processes.

Education **BS, Environmental Chemistry,** *California State University, Northridge, California,* 1998.

CHRISTOPHER J. ROSNEY
2011 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position	**GC/MS CHEMIST** – 2011 to Present
Responsibilities	Analyzing indoor air, ambient air and source emission samples by GC/MS methods, standard preparation, perform maintenance on instruments when required, real time data reduction, participate in peer review process, and good practice of all QA/QC requirements. **Documentation of Demonstration of Capabilities is available for review.**
Experience	Prior work history is not relevant to laboratory position.
Education	**BS, Chemistry,** *University of California, Irvine, California,* 2009.

KAREN H. RYAN

2006 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position — **TEAM LEADER (Media Preparation)** – 2011 to Present

Responsibilities — Responsibilities include waste disposal, canister conditioning and preparation, fulfillment of media requests; shipping, occasionally receiving samples, flow controller and critical orifice calibration and calibration checks. Additional responsibilities include coordination of canister maintenance and release and cleaning of canisters for field sampling, training within the department, sample media inventory and pressure/vacuum gauge inventory and calibration checks between calibrations.

Experience

Project Manager / GC/MS Chemist, *Columbia Analytical Services, CA, 2010-2011*. Provided technical project management and customer service to clients, includes project scheduling, tracking and consulting. Coordinates with personnel to ensure that analyses are properly executed and meets the client's needs. Responsibilities also included analyzing air, by GC/MS methods, standard preparation, performing maintenance on instruments when required, real time data reduction, participation in peer review process, and good practice of all QA/QC requirements.

Project Manager / VOA (Soil/Water) Team Leader, *Columbia Analytical Services, CA, 2006-2010*. Provided technical project management and customer service to clients, includes project scheduling, tracking and consulting. Coordinates with personnel to ensure that analyses are properly executed and meets the client's needs. Responsibilities as Team leader for the VOA (Soil/Water) group include training of chemists, peer review of analytical data, mentoring of junior analysts, SOP review and streamlining methods.

Chemist, Semi-Volatile Organics, *Columbia Analytical Services, Inc., Canoga Park, CA,* 1999-2006. Responsible for analytical services to comply with State and Federal regulatory requirements. Performed and coordinated workload and trained personnel as necessary. Participated in method development and certification, as well as method troubleshooting and instrument maintenance.

Research and Development Laboratory Supervisor, *Applied Silicone Corporation, Ventura, California,* 1997-1999. Supervised work within department, followed ISO 9001 guidelines. Developed silicone chemical formulations. Maintained laboratory notebooks. Performed project coordination for molding device applications, client contacts/consultations, solved staff technical inquiries and design specifications. Organized and scheduled molding time to ensure prompt product delivery. Certified as an ISO 9000 Internal Auditor.

GC Chemist and GC/MS Chemist, *Fruit Growers Laboratory Inc., Santa Paula, California,* 1996-1997. Scheduled and performed sample analysis by established EPA methods using GC and GC/MS. Performed TOC sample analysis. Managed instrumentation and department expenditures.

GC Chemist, *Pace Inc., Camarillo, California,* 1991-1995. Scheduled and performed sample analysis using various GC methods. Monitored and approved test results and turn-around times. Managed equipment and expenditures within department. Revised and maintained all SOPs and MDLs.

Extraction Chemist, *Coast to Coast Analytical Services, Camarillo, California,* 1991. Scheduled and performed sample extraction using various EPA methods. Prepared working spike standards within the department. Calibrated laboratory equipment.

Education

BS, Chemistry, *California Lutheran University, Thousand Oaks, California,* 1991.
AA, Liberal Arts, *Oxnard College, California*, 1987.

SHREEJANA "SHREE" SINGH
2005 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position **SYSTEMS ANALYST** – 2005 to Present

Responsibilities Electronic data deliverable (EDD) generation, review and reporting in accordance with both in-house and client specifications. Validation of laboratory and client valid values for input into Corporate valid value list for reports and EDDs. Coordination of EDD generation setup and compliance utilizing the laboratory EDD generation software with Corporate IT. Assisting with Laboratory Information Management Systems (LIMS) setup for EDD production and reporting.

Experience

Manager/Account Executive, *Imax Bancard Network, LLC, Valencia, California, 2004-2005*. Responsibilities included testing of Max software system, created organizational and work flowchart in Visio, tested online application, assist assigned agents with all their inquiries, assist merchants, underwrite new accounts, run and analyze credit reports, board accounts to First Data, send profile request for Nashville and Cardnet, board accounts on Vital, prepare stage only file sheet for deployment, help merchants obtain Amex and Discover processing, review TMF report, MES maintenance- DDA Change, DBA Change, prepare merchant kits for new merchants, Telemarketing lead data management in Excel, etc.

Report Production, *Columbia Analytical Services, Inc. Simi Valley, California. 2004-Temporary Assignment.* Responsibilities included data entry into Excel, created charts and prepared reports.

System Administrator, *Countrywide, Calabasas, California, 2004*. Responsibilities included download SQL reports in AS400-General Ledger System, Audited Active/Inactive Cost Centers and prepared reports, Granted Hyperion Access to employees, Created Monthly Maintenance Calendar, Downloaded and refreshed Treasury Bank accounts, Assisted Department Manager with Special Projects, Prepared/Maintained Excel Database of Cost Centers Created Organizational Chart for Corporate Accounting.

Purchaser, *Countrywide, West Hills, California, 2004*. Responsibilities included, reviewed and entered Closed Loan Packages to the System, suspended Account for incomplete packages.

Internet Specialist, *Cardservice International, Agoura Hills, California, 1994-1999*, responsibilities included Educated Sales Agents and merchants regarding e-commerce solutions, coordinated gateway integration of major clients with Technical Support and Programming, provided weekly reports to the Senior Management regarding Payment Gateway, coordinated multiple departments on resolution of technical and logistical issues, met with various vendors, prepared monthly sales and profitability reports, downloaded all new accounts and prepared spreadsheet for VP-Internet Commerce Group, prepared commission statement for agents, sales and accounting department, assisted merchants with new applications and procedures, reviewed new/existing merchant accounts for profitability and adjusted rates and fees, prepared daily company sales and revenue reports, reviewed and recommended existing and new department procedures for better efficiency, trained new employees, ran SQL report for various departments through NOAH system, prepared commission statement for agents and sales department, maintained and managed high volume accounts, audited new merchant accounts for accuracy on rates, fees, and setup, audited and prepared report listing all merchants using the 1-800# according to the agent, prepared and provided daily department reports, assisted Department Manager with special projects, provided administrative support to the department staff, handled all incoming merchant inquiries from merchants, reprogrammed existing point of sale terminals to dial out local access numbers.

Education **BS, Information Systems, Option: Business,** *California State University, Northridge, CA,* 2003.

SASHA R. SOMMER

2010 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position	**Analyst III** – 2010 to Present
Responsibilities	Analyzing indoor air, ambient air and source emission samples by GC/MS methods including EPA TO-17; preparation and modification of Excel spreadsheets and macros for data reporting and QC. **Documentation of Demonstration of Capabilities is available for review.**
Experience	**Department Assistant**, *California Lutheran University, Thousand Oaks, CA.*, 2009-2010. Aided students with Jmol and Adobe Dreamweaver programs for online Macromolecular Museum projects carried out during genetic lab courses. Created new student projects for developmental biology courses. The projects generated made use of sea urchin and Drosophila specimens for educational insight into microdissection, fluorescent microscopy, scanning electron microscopy and in vitro fertilization. Refined microbiological experiments that helped students in their ability to conduct dilutions for plate counts, sterilely prepare and stain various wet and dry slides, cultivate streak plates, incubate samples at appropriate temperatures and time periods, and prepare media. **Student Lab Researcher**, *California Lutheran University, Thousand Oaks, CA.*, 2008-2010. Employed proficiency of organic synthesis to optimize reactions which focus on Suzuki coupling methodology for the creation of novel organic materials that are useful for pharmaceutical and material chemistry. Utilized knowledge of gas chromatography-mass spectrometry (GC-MS) and nuclear magnetic resonance (NMR) to identify novel compounds. Attended 2010 American Chemical Society Conference and presented group research in poster and oral session.
Education	**BS, Biology (Major), Chemistry (Minor)**, *California Lutheran University, Thousand Oaks, CA.*, 2010.

MICHAEL TUDAY
1988 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position

DIRECTOR OF RESEARCH AND DEVELOPMENT – 2002 to Present

Responsibilities

Responsibilities include identifying new markets, determining laboratory feasibility, providing guidance in business development, marketing, and overseeing method development. Review of contract proposals, pricing and intuitive review of analytical data prior to it being released to the client. Also involved in writing and implementing training sessions and acts as a project manager when necessary. Project Manager responsibilities include interfacing with clients to provide technical project management and customer service, including project scheduling, tracking and consulting to determine appropriate sampling and analytical protocols. Coordinates with the laboratory and administration to ensure that analyses are properly executed and meets the clients' needs.

Experience

Laboratory Director, *Columbia Analytical Services, Inc., DBA Performance Analytical, Inc., Los Angeles, California,* 1994-2002. Responsibilities include managing technical operations, employee development and business operations (financial and marketing). Overseeing the Quality Assurance activities and reviewing analytical data for final report approval. Advising clients of appropriate sampling and analytical protocols related to air testing data interpretation. Participating in the development and validation of new sampling and analysis protocols. Serving as an expert witness in legal cases requiring testimony. Lecturing for educational courses and association meetings.

Laboratory Director/Owner, *Performance Analytical, Inc, Canoga Park, California,* 1988-1994. Duties primarily as listed above.

Laboratory Technical Manager, *C-E Environmental Inc., EMSI, Camarillo, California*, 1984-1988. Responsibilities included Program management of EPA Contract Laboratory Program and Special Analytical Services Contracts. Project Management for several large multidisciplinary projects, including the Love Canal Habitability Study. Initiated the development of the Air Toxics Analysis Laboratory. Served as Technical Marketing Coordinator for Laboratory Services (cost proposals and technical plans). Previously responsible for the supervision of the Gas Chromatography/Mass Spectrometry Laboratory.

GC/MS Laboratory Supervisor, *International Technology Corporation, Cerritos, California*, 1981-1984. Responsibilities included: Supervision of ten chemists in a large commercial laboratory. Projects included EPA Contract Laboratory Program analyses, EPA EMSL-Cinn drinking water method development and analysis contracts, Battelle and Radian interlaboratory method validation studies, hazardous waste characterization, analytical support for Remedial Investigations/Feasibility Studies, groundwater and wastewater effluent monitoring, commercial product deformulation and industrial hygiene analysis.

Chemist, Chromatography Laboratory, *O'Brien & Gere Engineers, Inc., Syracuse, New York*, 1980-1981. Responsibilities included: Performance of trace organics analysis of environmental samples for pesticides/PCBs, chlorophenoxyacid herbicides, and volatile organic compounds by gas chromatography.

Education

BS, Chemistry, *State University of New York, Oswego, New York,* 1980.
SHORT COURCES IN: Chemical Ionization GC/MS, INCOS Operation, and MS Interpretation, *Finnigan Institute, Cincinnati, Ohio.*

Affiliations

Air & Waste Management Association
Southern California Environmental Chemists Society
American Industrial Hygiene Association

ZHENG WANG
2004 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position

SVOA CHEMIST– 2011 to Present

Responsibilities

Responsibilities include analyzing ambient air, source emissions, and industrial hygiene samples using GC, GC/MS and HPLC. Preparation and analysis of air samples taken on various sorbent tubes for semi-volatile organic compounds. Determination of Carbonyls, Phenols and Cresols in ambient air and source emission samples using HPLC. Other responsibilities include standard preparation, performing maintenance on instruments when required, real time data reduction, participation in peer review process, and good practice of all QA/QC requirements.

Documentation of Demonstration of Capabilities is available for review.

Experience

GC Chemist, *Columbia Analytical Services Inc., Simi Valley, CA,* 2004-2011. Analysis of vapor phase and liquid samples for various volatile compounds, perform maintenance on instruments when required, real time data reduction, participate in peer review process, maintain working knowledge of all GC methods performed in laboratory, and good practice of all QA/QC requirements.

Chemist, *Atmospheric Analysis and Consulting, Inc., Ventura, CA,* 2003. Responsible for the analytical method development and validation of testing raw materials, environmental pollutants and the documentation of quality control standards and analytical results. Overview all laboratory equipment. Perform and revise testing methodologies when necessary. Apply EPA, ASTM, SCAQMD, and SW 846 methods to analyze volatile organic compounds.

Senior Research Associate, *China National Petroleum Corporation, Renqiu, Hebei, China,* 1988-2000. Developed and validated analytical methods for the analysis of geological samples and conducted organic geochemistry evaluation using HPLC, GC/MS, UV, IR, fluorescent detection and column chromatography. Performed separation and quantitative analysis of crude oil and bitumen A, including saturate and aromatic compounds, non-hydrocarbon and asphaltenes by using HPLC and column chromatography. Evaluated and calculated organic matter abundance. Performed analysis of the saturate (C8-C35), headspace gas (c1-C5), and aromatic by using GC and GC/MS. Parameters of evaluating geochemistry were calculated from GC spectrum. Performed identification and analysis of biomarkers in saturate compounds by GC/MS. Parameters of gas and oil migration were calculated from mass spectrum. Documented and wrote analytical protocols and reports. Maintained the analytical instruments include GC, GC/MS, HPLC, UV, IR, etc. Managed the development and growth of technicians.

Education

MS, Organic Chemistry, *New Mexico Highland University, Las Vegas, New Mexico,* 2002.

BS, Analytical Chemistry, *Ningxia University, Yinchuan, Ningxia, China*. 1988

Affiliations

American Chemical Society; Chinese Petroleum Society

MANUEL "MANNY" ZAMORA

2005 TO PRESENT

Columbia Analytical Services, Inc., 2655 Park Center Dr., Ste. A, Simi Valley, CA 93065 805.526.7161

Current Position

SAMPLE MANAGEMENT CUSTODIAN / TEAM LEADER – 2005 to Present

Responsibilities

Primary responsibilities include managing sample management personnel and their responsibilities, logging in samples and requested analyses, coordination of local courier services, distribution of service request forms to each department, storage and disposal of samples, and shipment of samples to other laboratories. Responsible for evaluating sample receipt compliance against the appropriate method requirements and recording any deviations. Also, maintains calibration and log of thermometers, as well as recording temperatures of all refrigerators and freezers and coordination of local courier services.

Experience

Sample Management Technician – *Columbia Analytical Services, Inc., Canoga Park, CA,* 2002-2005. Responsible for the receipt of groundwater and soil samples into the lab. Maintained proper documentation of sample receipt by following chain-of-custody (COC) procedures. Checked the number of samples received against the COC to account for all the samples. Logged samples into the laboratory; labeled samples; checked pH of preserved samples; and input tests required for each sample into the computerized Laboratory Information Management System (LIMS). Performed courier services (e.g., transported samples or bottle orders between clients and laboratory), field services (e.g., taking field samples for the clients), and bottle order preparation (e.g., adding preservation into bottles and containers for delivery to clients for sampling).

Facilities Assistant – Mailroom, *Xircom, Inc., a division or INTEL, Thousand Oaks, California,* 1998-2002. Responsible for pickup, sorting, and delivery of company mail from the Post Office; administration of computerized shipping system for corporate shipping; assist with daily maintenance of company buildings; stock/purchase office supplies and snacks/drinks for the Company snack machines.

Stockroom Administrator, *American Network Systems, Simi Valley, California,* 1997-1998. Responsible for operation of the warehouse, including receipt/inspection of incoming materials and shipment of product worldwide. Administrative duties included production of export documents required for international shipments; creation of work orders, transfers, new order entry, and monthly inventory report transactions.

Material Handler II - Shipping, *Xircom, Inc., a division or INTEL, Thousand Oaks, California,* 1994-1997. Responsible for daily inventory reports and daily RMA and Sales Order logs. Responsible for all internal material transfers, including freight calculation.

Receiving Clerk, *Hewlett Packard, Eesof Inc., Westlake Village, California,* 1992-1994. Responsible for receipt documentation, and distribution of all deliveries. Coordinated inspection of fabricated materials with Quality Assurance.

Education

COURSEWORK, Business Administration, *Moorpark College, California,* 1982-1985.

JEFFREY D. CHRISTIAN

1989 TO PRESENT

Columbia Analytical Services, Inc., 1317 South 13th Ave., Kelso, WA 98626 360.577.7222

Current Position

CHIEF OPERATING OFFICER (COO) – 2010 to Present

Responsibilities

Responsible for oversight of operating units of Columbia Analytical Services, inc. with all Laboratory Directors reporting to the COO. Primary responsibilities include establishment of consistent quality, technical, and client service enhancements across the company, as well as the financial performance of the individual operating units. In addition, a significant role is to represent operations as a member of the Senior Management Team (SMT) consisting of the Chief Executive Officer, Chief Financial Officer, Chief Quality Officer, and the Director of Information Technology.

Experience

Vice President/Laboratory Director, Kelso Laboratory, *Columbia Analytical Services, Inc., Kelso, Washington,* 1993-2010. Responsible for all phases of laboratory operations, including project planning, budgeting, and quality assurance.

Operations Manager, Kelso Laboratory, *Columbia Analytical Services, Inc., Kelso, Washington,* 1992-1993. Responsibilities included directing the daily operation of the Kelso laboratory. Other responsibilities and duties included functioning as a technical consultant to clients, providing assistance in developing and planning analytical schemes to match client objectives, and writing and developing analytical procedures/methods. Also, served as Project Manager for State of Alaska Department of Environmental Conservation contract and Coordinator for EPA Special Analytical Services (SAS) contracts.

Project Chemist and Manager, Metals Analysis Laboratory, *Columbia Analytical Services, Kelso, Washington,* 1989-1992. Responsible for directing the daily operation of the Metals Laboratory, including the sample preparation, AAS, ICP-OES, and ICP-MS Laboratories.

Scientist, *Weyerhaeuser Technology Center, Federal Way, Washington,* 1986-1989. Responsibilities included supervising atomic spectroscopy laboratory which included flame and furnace AAS, ICP-OES, and sample preparation capabilities to handle a wide variety of sample types. Interfaced with internal and external clients to provide technical support. Wrote and developed analytical procedures/methods.

Lead Technician, Metals Lab, *Weyerhaeuser Technology Center, Federal Way, Washington*, 1981-1986. Responsibilities included primary ICP and AAS analyst for EPA-CLP contract work. Extensive experience in wide variety of environmental and product-related testing.

Research Assistant, *ITT Rayonier, Olympic Research Division, Shelton, Washington,* 1978-1981. Responsibilities included performing water quality tests, product-related analytical tests, corrosion tests (i.e., potentiometric polarization techniques), and operated pilot equipment specific to the pulp and paper industry.

Education

B.S., Chemistry, *Evergreen State College, Olympia, Washington,* 1993.
Coursework, *Pacific Lutheran University, Tacoma, Washington.* 1988-1989.
Coursework, *Tacoma Community College, Tacoma, Washington.* 1970-1971, 1988-1989.
CERTIFICATION, Chemistry, *L.H. Bates Technical, Tacoma, Washington,* 1976-1978.
Coursework, *Central Washington University, Ellensburg, Washington.* 1969-1970.
Numerous Training/Educational Activities via Conferences, Professional Seminars, and Factory Training, 1989-2010.

Publications/ Presentations

Mr. Christian has a number of publications and presentations. For a list of these publications and presentations, please contact CAS.

LEE E. WOLF

1988 TO PRESENT

Columbia Analytical Services, Inc., 1317 South 13th Ave., Kelso, WA 98626 360.577.7222

Current Position — **QUALITY ASSURANCE DIRECTOR AND CHIEF QUALITY OFFICER** – 2008 to Present

Responsibilities — Directing the overall corporate-wide quality systems and ethics programs for all CAS facilities. Responsible for ensuring that CAS quality systems and data integrity standards are implemented at all facilities. Act as liaison with government entities involving quality, technical and operational issues. Provide QA input and policy as needed for operations, development initiatives, special projects, planning, and information technology implementation. Provide assistance to QA Program Managers.

Experience

Technical Manager IV, Quality Assurance Program Manager, *Columbia Analytical Services, Inc., Kelso, Washington* – 2002 to 2008. As part of the management team, responsibilities included the overall management and implementation of the laboratory QA program. This included maintaining accreditations and certifications, and maintaining all necessary documents (QA Manual, SOPs, and QA records). Acted as primary point of contact during laboratory audits and provided audit responses and corrective actions. Coordinated performance audits (PE/PT testing) and conducted internal audits.

Scientist IV, Quality Assurance Program Manager, *Columbia Analytical Services, Inc., Kelso, Washington,* 1996-2002. Duties primarily as listed above.

Project Chemist/Principal Organic Scientist, *Columbia Analytical Services, Inc., Kelso, Washington,* 1994-1996. Responsibilities included GC and GC/MS method development and special projects coordination. Acts as technical advisor to the GC and GC/MS laboratories and GC/MS interpretation specialist and CLP organics specialist. Also responsible for Project Chemist functions, including management of projects for clients, identifying client needs, and preparation of data reports.

Semivolatile Organics Department Manager, *Columbia Analytical Services*, 1988-1994. Responsibilities included overall management of the department. Supervised GC/MS analyses, data review, reporting and related QA/QC functions. Responsible for supervision of staff, training, and scheduling. Beginning in 1992, responsibilities included being a Project Chemist for organics EPA-SAS and other clients. This involved scheduling projects for clients, identifying client requirements, and preparing data reports.

GC/MS Chemist, *U.S. Testing Co., Richland, Washington*, 1985-1988. Responsibilities included GC and GC/MS analysis of water and soil samples for volatiles and semivolatiles by EPA protocol, including Methods 8240, 8270 and CLP. Coordinated extraction and GC-GC/MS areas to manage sample/data flow through the lab. Also performed HPLC analysis and pesticide analysis by GC using EPA Methods.

Laboratory Assistant, *Eastern Washington University, Cheney, Washington,* 1985. Responsibilities included supervision and instruction of organic chemistry labs. Experience with GC and IR operation. Responsible for lab safety.

Education

Pharmaceutical Laboratory Control Systems, *Univ. of Wisconsin Short Course, Las Vegas,* 2004
Test Method Validation in Pharmaceutical Development and Production, *Univ. of Wisconsin Short Course, Las Vegas,* 2004
Documenting Your Quality System, *A2LA Short Course, Las Vegas, Nevada*, 1998.
Internal Laboratory Audits, *A2LA Short Course, Las Vegas, Nevada,* 1998.
Mass Spectra Interpretation, *ACS Short Course, Denver, Colorado*, 1992.
BS, Chemistry, *Eastern Washington University, Cheney, Washington,* 1985.

Publications/ Presentations

Selected Ion Monitoring: Issues for Method Development, Panel Discussion, Association of Official Analytical Chemists, (AOAC) Pacific Northwest Regional Meeting, 1995.
Method Enhancement Techniques for Achieving Low level Detection of Butyl Tin in Marine Sediments and Tissues, Association of Official Analytical Chemists (AOAC) Pacific Northwest Regional Meeting, 1994.
The Determination of Low-Level Concentrations of Polynuclear Aromatic Hydrocarbons (PAHs) in Soil and Water Using Gas Chromatography/Mass Spectroscopy Selected Ion Monitoring (GC/MS SIM), HazMat West, Long Beach, California, 1992.

Affiliations — American Chemical Society.

Columbia Analytical Services INC

JAMES M. CARLSON

1999 TO PRESENT

Columbia Analytical Services, Inc., 1317 South 13th Ave., Kelso, WA 98632 360.577.7222

Current Position Responsibilities

PRESIDENT AND CHIEF EXECUTIVE OFFICER – 2010 to Present

Responsible for overall management direction and coordination of all business activities, develops and implements business plans. Works closely with Branch Managers, and support staff, including Financial and Administration. Approves all policies, procedures, plans, and programs for the company and ensures their conformity with corporate guidelines and policies. Approves annual operating budgets for the branch offices and ensures operations perform within approved budget limits. Stays abreast of technological developments and trends, which could lead to new applications or markets. Maintains good client relations and actively pursues expansion of new clients and business lines in conjunction with regional and corporate marketing goals.

Experience

CHIEF OPERATING OFFICER (COO), *Columbian Analytical Services, Kelso, Washington,* 1999-2010. Responsible for oversight of operating units of Columbia Analytical Services, inc. with all Laboratory Directors reporting to the COO. Primary responsibilities include establishment of consistent quality, technical, and client service enhancements across the company, as well as the financial performance of the individual operating units. In addition, a significant role is to represent operations as a member of the Senior Management Team (SMT) consisting of the Chief Executive Officer, Chief Financial Officer, Chief Quality Officer, and the Director of Information Technology

Financial Services Manager, *BHP Coated Steel Corporation, Kalama, Washington,* 1997-1999. Developed and managed the financial accounting and services department for a two-plant facility with revenues exceeding $200 million. Supervised a staff of 11 and provided shared services for five organizations. Responsible for all internal and external financial reporting and audit requirements. Additional duties included supporting the general management team as relief CFO and acting as a meeting and process facilitator.

Finance and Administration Manager, *BHP Diamonds, Inc., Yellowknife, Northwest Territory, Canada,* 1993-1997. Developed and managed effective accounting, financial reporting, purchasing, and logistics systems for the start up of the BHP/Blackwater NWT Diamond Project in the high Arctic. Negotiated and administered contracts related to the supply of goods, services, and facilities for the construction and administration of the 100 person camp, including the development of HR, safety, and security systems. Participated in the general management team, including extensive public relations regarding the project's environmental and socioeconomic impacts. Participated in negotiations involving aboriginal, provincial, and the Canadian federal government.

Accounting and Administration Manager, *BHP Exploration, Herndon, Virginia,* 1992-1993. Controller and administration manager for BHP's world coal and industrial minerals programs. Oversight of 12 international office locations, including the 40-person office in Herndon, Virginia, and 30 international exploration and geophysical projects. Responsible for all aspects of office and accounting administration, including international and domestic staffing. Retained local external accounting and legal services in foreign locations and negotiated foreign labor agreements.

Education

Leading Organizational Change Program, *BHP, Kalama, Washington,* 1998.
Global Leadership Program 2, *BHP, Kota Kinabalu, Malaysia,* 1995.
Resident Management Course I, *BHP, Melbourne, Australia,* 1993.
BS, Business Administration/Accounting, *California State University, San Jose, California,* 1986.

APPENDIX C

MAJOR ANALYTICAL EQUIPMENT

Equipment Description - Gas Chromatography	Purchased / Acquired	Location
Screen 02: Hewlett-Packard 5890 with FID/ECD Detectors	-	VOA GC/MS
Screen 03: Hewlett-Packard 5890 with FID Detector	-	VOA GC/MS
GC01: Hewlett-Packard 5890 with FID/TCD Detectors *Fixed Gas Analyzer/Total Combustion Aanlyzer (TCA)*	1995	VOA GC
GC03: Hewlett-Packard 5890 with ECD/FID Detectors *Hewlett-Packard 7673 Autosampler*	1995	SVOA
GC05: Hewlett-Packard 5890 Series II with Sievers SCD Detector	1996	VOA GC
GC06: Hewlett-Packard 6890 with ECD/ECD Detectors *Hewlett-Packard 6890 Autosampler*	1995	SVOA
GC07: Hewlett-Packard 6890 with FID/FID Detectors	1995	VOA GC
GC08: Hewlett-Packard 5890 Series II with TCD/FID Detectors	1998	VOA GC
GC09: Hewlett-Packard 5890 Series II with FID/ECD Detectors	1999	GC/MS Screen
GC10: Hewlett-Packard 5890A with FID/TCD Detectors	1999	VOA GC
GC11: Hewlett-Packard 5890 Series II+ with FID Detector (Combined with MS01)	1999	SVOA
GC12: Hewlett-Packard 5890 Series II+ with FID Detector (Combined with MS02)	2004	SVOA
GC13: Agilent 6890A with Sievers SCD Detector	2001	VOA GC
GC14: Agilent 6890N with NPD/FID Detectors *Agilent 7683B Autosampler*	2005	SVOA
GC15: Agilent 6890N with NPD/FID Detectors *Agilent 7683 Autosampler*	2005	SVOA
GC16: Agilent 6890N with PFPD Detector and *OI Detector Controller* *Agilent 7683 Autosampler*	2005	SVOA
GC17: Hewlett-Packard 5890 with FID Detectors	2006	NOT IN SERVICE
GC18: Hewlett-Packard 5890 Series II with OI PID/FID Detectors	-	NOT IN SERVICE
GC19: Hewlett-Packard 5890 with FID Detector	2007	VOA GC
GC20: Agilent 7890A with FID/TCD Detectors	2008	VOA GC
GC21:Hewlett-Packard 5890 Series II with ECD/FID Detectors	2009	SVOA
GC22: Agilent 7890A with Agilent SCD detector	2009	VOA GC
GC23: Hewlett-Packard 6890+ with ECD Detector (Combined with MS14)	2007	SVOA
GC24: Hewlett-Packard 5890 Series II (Combined with MS04)	2011	VOA GC R&D
GC25: Hewlett-Packard 5890 Series II (Combined with MS12)	2006	SVOA
GC26: Agilent 7890A (Combined with MS19)	2011	VOA GC/MS
GC27: Agilent 7890A (Combined with MS20)	2011	VOA GC/MS

Equipment Description - GC/MS Systems	Purchased / Acquired	Location
MS01: HP 5890 Series II+ with FID Detector (GC11) & HP 5971A MSD *Hewlett-Packard 7673 Autosampler*	1991	SVOA
MS02: HP 5890 Series II+ with FID Detector (GC12) & HP 5972 MSD *Hewlett-Packard 7673 Autosampler*	1994	SVOA
MS03: HP 6890A/5973 MSD *Tekmar AUTOCAN Autosampler*	1997	VOA GC/MS
MS04: HP 5970 MSD (Combined with GC24)	2004	VOA GC R&D
MS05: Agilent 6890+/5973N MSD *Perkin Elmer TurboMatrix ATD-50 Thermal Desorber*	1999	VOA GC/MS
MS07: HP 6890A/ Agilent 5973N MSD *Tekmar AUTOCAN Autosampler*	2001	VOA GC/MS
MS08: Agilent 6890N/5973inert MSD Tekmar AUTOCAN Autosampler	2004	VOA GC/MS
MS09: Agilent 6890N/5973inert MSD Tekmar AUTOCAN Autosampler	2005	VOA GC/MS
MS10: HP 6890A/5973 MSD Tekmar AUTOCAN Autosampler	2006	VOA GC/MS
MS11: HP 5890 Series II/5972 MSD Tekmar AUTOCAN Autosampler	2006	VOA GC/MS
MS12: HP 5890 Series II/5971 MSD HP 7673 Autosampler	2006	SVOA
MS13: Agilent 6890N/5975B inert MSD Tekmar AUTOCAN Autosampler	2006	VOA GC/MS
MS14: HP 6890+ with ECD Detector (GC23) & HP 5973 MSD HP 6890 Injector	2007	SVOA
MS15: HP 5890 Series II/5972 MSD HP 7673 Autosampler	2007	SVOA
MS16: Agilent 6890N/5975C inert MSD Tekmar AUTOCAN Autosampler	2007	VOA GC/MS
MS17: Shimadzu GCMS QP-2010 Plus	2008	SVOA
MS18: Agilent 7890A /5975C inert XL MSD Markes Series 2 Unity Thermal Desorber Markes Series 2 Ultra TD Autosampler	2010	VOA GC/MS
MS19: Agilent 7890A /5975C inert XL MSD Tekmar AUTOCAN Autosampler	2011	VOA GC/MS
MS20: Agilent 7890A /5975C inert XL MSD Markes Series 2 Unity Thermal Desorber Markes Series 2 Ultra TD Autosampler	2011	VOA GC/MS

Liquid Chromatography	Purchased / Acquired	Location
LC01: Waters Liquid Chromatograph Module I Plus/UV_Vis 360	1995	SVOA
LC03: Agilent Infinity LC 1220	2011	SVOA
LCMS01: Agilent 6120 Quadrupole MS (Combined with LC03)	2011	SVOA
Ion Chromatography	**Purchased / Acquired**	**Location**
IC02: Metrohm with Lambda 1010 830 IC Interface, 830 IC Liquid Handling Units 818 IC Pump, 820 IC Separator Center	2004	GENCHEM
IC03: Dionex ICS 2000 with Self-regenerating suppressor AS40 Autosampler	2008	GENCHEM
Spectrophotometer	**Purchased / Acquired**	**Location**
SPM01: Spectronic Instrument 20+ from SC	2001	GENCHEM
pH and Specific Ion Meters	**Purchased / Acquired**	**Location**
pH01: Thermo Orion 920 Selective Ion Meter	2001	GENCHEM
pH02: Orion 720A	1992	GENCHEM
Miscellaneous Equipment	**Purchased / Acquired**	**Location**
US Filter Water Purification System	2006	Main Lab
US Filter Water Purification System	2008	Extraction facility

Note: Purchase / Acquired year may represent when instrument was first maintained by CAS/Simi Valley or other in-network CAS Laboratory and does not reflect age of instrument.

Air sampling containers / Flow Controllers / Critical Orifices

Six-liter Summa passivated stainless steel canisters

- 1372 Ambient
- 994 Source
- 190 Standard

Six-liter Silonite passivated stainless steel canisters

- 96 Ambient
- 40 Source

Three-liter Silco passivated stainless steel canisters (78)

Meriter 2.4-liter passivated stainless steel canisters (25)

One-liter Summa passivated stainless steel canisters (895)

400-millilter mini passivated stainless steel canisters (19)

Low volume flow controllers for time integrated sampling

- 363 Ambient
- 136 Source

Low-flow flow controllers for multi-day sampling (53)

Mini-canister flow controllers for time integrated sampling (16)

Critical orifices (1697)

Automated Summa Canister Conditioning Units

- Twelve-position, microprocessor controlled conditioners with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (2)
- Ten-position, microprocessor controlled conditioners with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (2)
- Fourteen-position, microprocessor controlled conditioners with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (1)
- Fifteen-position, microprocessor controlled conditioners with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (1)
- Sixteen-position, microprocessor controlled conditioner with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (1)
- Six-position, microprocessor controlled conditioner with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (1)

APPENDIX D

DATA QUALIFIERS AND ACRONYMS

Columbia Analytical Services

CODE	CATEGORY	DESCRIPTION
BC	AIHA	Reported results are not blank corrected.
BH	AIHA	The back section of the tube yielded higher results than the front.
BT	AIHA	Results indicated possible breakthrough; back section ≥10% front section.
DE	AIHA	Reported results are corrected for desorption efficiency.
RA	AIHA	Result not available.
G	GENERAL	Improper container.
G1	GENERAL	Unpreserved or improperly preserved sample.
X	GENERAL	See case narrative.
H1	HOLD TIME	Sample analysis performed past holding time. See case narrative.
H2	HOLD TIME	Initial analysis within holding time. Reanalysis for the required dilution was past holding time.
H3	HOLD TIME	Sample was received and analyzed past holding time.
H4	HOLD TIME	Sample was extracted past required extraction holding time, but analyzed within analysis holding time. See case narrative.
i	MATRIX	The MDL/MRL has been elevated due to matrix interference.
M	MATRIX	Matrix interference; results may be biased (high/low).
M1	MATRIX	Matrix interference due to coelution with a non-target compound. (TO-15 only)
Q	PETROLEUM	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter/heavier molecular weight constituents than the calibration standard.
Y	PETROLEUM	The chromatogram resembles a petroleum product but does not match the calibration standard.
Z	PETROLEUM	The chromatogram does not resemble a petroleum product.
#	QC	The control limit criterion is not applicable. See case narrative.
*	QC	The result is an outlier. See case narrative.
B	QC	Analyte detected in both the sample and associated method blank.
I	QC	Internal standard not within the specified limits. See case narrative.
L	QC	Laboratory control sample recovery outside the specified limits; results may be biased (high/low).
N	QC	The matrix spike sample recovery is not within control limits. See case narrative.
R	QC	Duplicate precision not met.
R1	QC	Duplicate precision not within the specified limits; however, the results are below the MRL and considered estimated.
S	QC	Surrogate recovery not within specified limits.

CODE	CATEGORY	DESCRIPTION
V	QC	The continuing calibration verification standard was outside (biased high/low) the specified limits for this compound.
C	RESULT	Result identification confirmed.
CE	RESULT	Co-elution.
D	RESULT	The reported result is from a dilution.
E	RESULT	Estimated; concentration exceeded calibration range.
J	RESULT	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
J1	RESULT	The analyte was positively identified below the method reporting limit prior to utilizing the dilution factor; the associated numerical value is considered estimated.
K	RESULT	Analyte was detected above the method reporting limit prior to normalization.
ND	RESULT	Compound was analyzed for, but not detected above the laboratory reporting/detection limit.
P	RESULT	The confirmation criterion was exceeded. The relative percent difference was greater than 40/25% between the two analytical results.
U	RESULT	Compound was analyzed for, but not detected (ND) at or above the MRL/MDL.
W	RESULT	Result quantified, but the corresponding peak was detected outside the generated retention time window.
UJ	RESULT	The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
Ui	RESULT	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL; however, the MRL/MDL has been elevated due to a matrix interference.
T	TIC	Analyte is a tentatively identified compound, result is estimated.

Note: Where specified by project requirements or laboratory circumstances dictate, these may be altered or additional ones utilized. All qualifiers must be completely and unambiguously defined.

APPENDIX E

PREVENTIVE MAINTENANCE PROCEDURES

PREVENTIVE MAINTENANCE PROCEDURES			
Instrument	**Applicable Activity**	**Frequency**	**Performed**
Gas Chromatographs • GC 01 • GC 03 • GC 05 • GC 06 • GC 07 • GC 08 • GC 10 • GC 11 • GC 12 • GC 13 • GC 14 • GC 15 • GC 19 • GC 20 • GC 22	Replace septum Check system for gas leaks, loose/fray wires and insulation Replace injection port liner ECD wipe test Thermally Clean ECD Clean FID Change TCD assembly SCD – Change reaction tube Catalyst check	As required With cylinder change/Open system As required Every 6 months As needed As required As required As required Annually	In-House & Outside Vendor
GC/MS Pairing • MS 01 • MS 03 • MS 04 • MS 05 • MS 07 • MS 08 • MS 09 • MS 10 • MS 11 • MS 12 • MS 13 • MS 14 • MS 15 • MS 16 • MS 17 • MS 18 • MS 19 • MS 20	Tune MSD Change Semi-VOA capillary column Change Semi-VOA injection port septum Change Semi-VOA injection port liner Replace trap (VOA) Clean ion source Change filament Change electron multiplier	As needed As needed As required As required As required As required As required As required	In-House & Outside Vendor
	Vacuum System: • Mechanical pumps: change oil, change trap pellets (HP only) • Diffusion pump: check oil, check cooling fan, change oil • Turbo pump	Check every 6 months, check level monthly, change at least annually or sooner is necessary As required Replace as required	In-House
	Air Preconcentrators/Autosampler: • Change traps • Inspect Rotors • Calibrate Mass Flow Controllers	As required As required Every 6 months	In-House

PREVENTIVE MAINTENANCE PROCEDURES			
Instrument	**Applicable Activity**	**Frequency**	**Performed**
HPLC • LC01 • LC03 (LCMS01)	Replace/clean check valve filter Replace lamp UV/vis detector Replace flow cell Check flow	As required As required As required Quarterly	In-House
Analytical Balances	Clean pan and compartment Check with NIST traceable weights Field service	Prior to and after use Prior to use Annually	In-House & Outside Vendor
Refrigerators and Freezers	Monitor Temperature Adjust Temperature Clean, Defrost	Daily As required As required	In-House
Ovens	Clean	As needed or if temperature is outside limit	In-House
pH probes • pH01 • pH02	Condition probe Change Filling Solution	When fluctuations occur Weekly	In-House
Fluoride ISE	Store in storage solution	Between uses	In-House
Ammonia ISE	Store in storage solution	Between uses	In-House
UV-visible Spectrophotometer	Wavelength check	Annually	In-House
Ion Chromatographs • IC02 • IC03	Change column bed supports Clean column Change column Change valve port face & hex nut Clean valve slider Change tubing Eluent pump	Monthly or as needed Monthly or as needed Every six months or as needed Every six months or as needed Every six months or as needed Annually or as needed Annually	In-House
Restek Thermal Gas Purifier	Check getter tube	Monthly, change as required	In-House

APPENDIX F

LABORATORY SOP LIST

Local ADM SOP Titles (CAS)	SOP Code
Data and Record Archiving	ADM-ARC
Conducting Internal Laboratory Audits	ADM-AUDIT
Batches and Sequences	ADM-BATCH_SEQ
Handling Consumable Materials	ADM-CONSUM
Ensuring Data Integrity	ADM-DATA_INT
Data Review and Reporting	ADM-DATA_REV
Electronic Data Tape Backup, Archiving & Restoration	ADM-DTAPES
Glassware Cleaning	ADM-GLASS
Analytical Instrument Acquisition, Reassignment, Maintenance and Documentation	ADM-INSTRUM
Laboratory Storage, Analysis and Tracking	ADM-LabSAT
Project Management and Business Development	ADM-PMgmt
Software and Data Quality Assurance	ADM-SftwreQA
Calibration and Use of Laboratory Support Equipment	ADM-SupEQ
Waste Disposal	DSP-WASTE
Media Request Fulfillment	MED-Media_Req
Cleaning and Certification of Summa Canisters & Other Specially Prepared Canisters	SMO-CanCert
Evaluation and Pressurization of Specially Prepared Stainless Steel Canisters	SMO-Can-Press
Flow Controllers and Critical Orifices	SMO-Flow_Cntrl
Sample Receiving, Acceptance and Log-In	SMO-SMPL_REC

Semi-Volatile SOP Titles	SOP Code
Determination of Formaldehyde and Other Carbonyl Compounds in Ambient Air Using Adsorbent Cartridge Followed by High Performance Liquid Chromatography (HPLC) EPA Compendium Method T0-11A	SVM-11A
Determination of Methanol, Acetaldehyde, MEK and Propionaldehyde in Pulp and Paper Process Liquids by GC/FID	SVM-NCASI_MeOH
Determination of Carbonyl Compounds in Solid and Liquid Samples by High Performance Liquid Chromatography (HPLC) per Modified EPA Method 8315A	SVM-M8315A
Determination of Organic Vapors Using GC/FID in Accordance with OSHA Method 07	SVO-OSHA_07
Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air Using Gas Chromatography/Mass Spectrometry (GC/MS)	SVM-13A
Preparation and Analysis of Octasulfur by Gas Chromatography/Mass Spectrometry (GC/MS) & Appendix	SVM-S8_MS
Preparation and Analysis of Octasulfur by Gas Chromatography/Electron Capture Detector (GC/ECD) & Appendix	SVM-S8_ECD
Sample and Media Preparation per EPA Compendium Method TO-13A	MSP-TO13A
Sample Extraction and Preparation of Pesticide and PCB Samples According to EPA Compendium Methods TO-4A and TO-10A	GCP-TO4A
Determination of Pesticides and Polychlorinated Biphenyls (PCBs) in Ambient Air by GC/ECD per EPA Compendium Methods TO-4 and TO-10A	SVG-TO4A
Determination of Volatile Amines in Ambient Air Using GC/NPD	SVG-Amines
Determination of Carboxylic Acids in Ambient Air Using GC/MS	SVM-CACIDS
Analysis of Halogenated Volatile Organic Compounds in Emissions from Stationary Sources using GC/ECD in Accordance with a Modification of CARB Method 422	VOA-CARB422
Analysis of Sulfur Hexafluoride in Accordance with a Modification of NIOSH 6602	SVG-SF6

Volatile SOP Titles	SOP Code
Analysis of Argon Using GC with Thermal Conductivity Detection	VOA-Argon
Dissolved Gas Analysis in Aqueous Samples Using a GC Headspace Equilibration Technique	VOA-DISGAS
Sample Preparation of Drywall for Sulfur Analysis and the Determination of Copper Corrosion	VOC-Drywall
Analysis of Sulfur Compounds in Liquid Samples by GC with Sulfur Chemiluminescence Detection	VOA-SH_2O_SCD
Analysis of Sulfur Compounds in Gas by GC with Sulfur Chemiluminescence Detection per Modified ASTM D 5504 and SCAQMD Method 307	VOA-S307M_SCD
Determination of Hydrogen, Carbon Monoxide, Carbon Dioxide, Nitrogen, Methane, and Oxygen using GC with Thermal Conductivity Detection in Accordance or modification of EPA 3C or ASTM D 1946	VOA-EPA3C
Determination of Total Gaseous Nonmethane Organic (TGNMO) Emissions as Carbon in Landfill Gases in Accordance with EPA Method 25C	VOA-EPA25C
Determination of Methane, Carbon Monoxide, Carbon Dioxide, and Total Gaseous Nonmethane Organic (TGNMO) Emissions as Carbon in Landfill Gases According to Modified EPA Method 25C	VOA-EPA25CM
Calculating Heat Value, Compressibility Factor, and Relative Density of Gaseous Fuels in Accordance with ASTM D 3588	VOA-BTU
Analysis of C1-C6+ using Gas Chromatography with Flame Ionization Detection in Accordance with a Modification of EPA Compendium Method TO-3	VOA-TO3C1C6
Analysis of Various Compounds using GC with Flame Ionization Detection in Accordance with a Modification of EPA Compendium Method TO-3	VOA-TO3MeOH
Analysis of Total Petroleum Hydrocarbons as Gasoline in Air by GC with Flame Ionization Detection	VOA-TPHG_TO3
Analysis of Hydrogen and Helium using GC with Thermal Conductivity Detection	VOA-HHe
Determination of Volatile Organic Compounds in Air Samples Collected in Specially Prepared Canisters and Gas Collection Bags and Analyzed by GC/MS	VOA-TO15; CASS TO-15/GC-MS
Determination of Volatiles in Ambient Air Using Active or Passive Sampling Onto Sorbent Tubes	VOA-TO17; CASS TO-17/GC-MS
Determination of Air-Phase Petroleum Hydrocarbons by GC/MS	VOA-MAPH

General Chemistry (WET) SOP Titles	**SOP Code**
pH Electrometric Measurement for Liquids by Ion Selective Electrodes	WET-pHL
pH Electrometric Measurement for Solids by Ion Selective Electrodes	WET-pHS
Nitrogen Dioxide in Air, Colorimetric Determination	WET-NO_2Air
Determination of Inorganic Anions by Ion Chromatography	WET-Anions_IC
Hexavalent Chromium by Ion Chromatography	WET-HexCr_IC
Hexavalent Chromium: Colorimetric, Liquids	WET-Cr6L
Hexavalent Chromium: Colorimetric, Solids	WET-Cr6S
Ozone in Air, Colorimetric	WET-O_3Air
Hydrofluoric Acid in Air by Ion Selective Electrode	WET-Hfair
Ammonia in Air by Ion Selective Electrode	WET-NH3Air
Hydrogen Sulfide in Air, Colorimetric	WET-H_2S Air

APPENDIX G

CERTIFICATIONS, ACCREDITATIONS, AND PRIMARY NELAP ACCREDITED METHODS

ACCREDITATIONS AND REGISTRATIONS

- American Industrial Hygiene Association (AIHA)
  Industrial Hygiene Laboratory Accreditation Program Laboratory
  Laboratory # 101661
  Approved Method(s):
  - **NIOSH 1450**
  - **NIOSH 1457**
  - **NIOSH 1500**
  - **NIOSH 1501**
  - **NIOSH 1550**
  - **OSHA 07**

- State of Arizona, Department of Health Services
  License No. AZ0694
  Approved Method(s):
  - **EPA TO-15**

- State of California, Department of Health Services, National Environmental Laboratory Accreditation Program (***NELAP-Primary***)
  Certification No. 02115CA
  Approved Method(s):
  - **EPA 7196A**
  - **EPA 7199**
  - **EPA 9040B**
  - **EPA 9045C**
  - **EPA 9056**

- State of Florida, Department of Health (***NELAP-Primary***)
  Laboratory ID No.: E871020
  Approved Method(s):
  - **EPA TO-13A**
  - **EPA TO-15**
  - **EPA TO-17**

- State of Minnesota, Department of Health, Environmental Laboratory Certification Program
  Laboratory ID: 006-999-438
  Approved Method(s):
  - **EPA TO-15**

- State of New York, Department of Health
  Environmental Analyses/Air and Emissions (***NELAP-Secondary***)
  Laboratory ID No. 11221
  Approved Method(s):
  - **EPA TO-15**

- State of New Jersey, Department of Environmental Protection (***NELAP-Secondary***)
  Laboratory ID: CA009
  Approved Method(s):
  - **EPA TO-15**

ACCREDITATIONS AND REGISTRATIONS (CONTINUED)

- State of Oregon, Environmental Laboratory Accreditation Program (***NELAP-Secondary***)
  Laboratory ID: CA200007
  Approved Method(s):
  - **EPA TO-15**

- State of Washington, Department of Ecology
  Laboratory ID: C946
  Approved Method(s):
  - **EPA TO-15**

- State of Texas, Texas Commission on Environmental Quality (***NELAP-Secondary***)
  Certificate # T104704413-11-2
  Approved Method(s):
  - **EPA TO-15**

- Department of Defense , Environmental Laboratory Accreditation Program (***DoD-ELAP***)
  Perry Johnson Laboratory Accreditation, Inc. Certificate No. L10-3 – R1
  Approved Method(s):
  - **RSK 175**
  - **CAS SOP VOA-EPA3C (EPA 3C, EPA 3C Modified & ASTM D 1946)**
  - **CAS SOP VOA-TPHG_TO3 (JP-4 and TPHG by Modified EPA TO-3)**
  - **CAS SOP VOA-TO3C1C6 (Hydrocarbons and ranges by Modified EPA TO-3)**
  - **EPA TO-15.**

- Commonwealth of Pennsylvania, Department of Environmental Protection Bureau of Laboratories
  Registration Number: 68 3307

Note 1: This Quality Assurance Manual is revised annually with AIHA, DoD and NELAP-Primary Certificates, and the Scope of Accreditations/Parameters are revised annually (where necessary). During this interim period Certificates may expire and the Scope of Accreditations/Parameters may change; therefore, these may not be updated until the next revision.

Note 2: Current Certificates and Scope of Accreditations/Parameters are on file and displayed in the front hallway. Updated or Specific Certificates and Scope of Accreditations/Parameters are available upon request.

AIHA

Laboratory Accreditation
Programs, LLC

AIHA Laboratory Accreditation Programs, LLC

acknowledges that

Columbia Analytical Services, Inc.
2655 Park Center Drive, Suite A, Simi Valley, CA 93065-6200
Laboratory ID: 101661

has fulfilled the requirements of the AIHA Laboratory Accreditation Programs (AIHA-LAP), LLC thereby conforming to the ISO/IEC 17025:2005 international standard, *General Requirements for the Competence of Testing and Calibration Laboratories*. The above named laboratory, along with all premises from which key activities are performed, as listed above, have been accredited by AIHA-LAP, LLC in the following:

LABORATORY ACCREDITATION PROGRAMS

√	INDUSTRIAL HYGIENE	Accreditation Expires: 11/01/2012
☐	ENVIRONMENTAL LEAD	Accreditation Expires:
☐	ENVIRONMENTAL MICROBIOLOGY	Accreditation Expires:
☐	FOOD	Accreditation Expires:

Specific Field(s) of Testing (FoT)/Method(s) within each Accreditation Program for which the above named laboratory maintains accreditation is outlined on the attached **Scope of Accreditation**. Continued accreditation is contingent upon successful on-going compliance with AIHA-LAP, LLC requirements. This certificate is not valid without the attached **Scope of Accreditation**. Please review the AIHA-LAP, LLC website (www.aihaaccreditedlabs.org) for the most current scope of accreditation.

Dave Sandusky, CIH
Chairperson, Analytical Accreditation Board

Date Issued: 09/01/2010

AIHA Laboratory Accreditation Programs, LLC

SCOPE OF ACCREDITATION

Columbia Analytical Services, Inc.
2655 Park Center Drive, Suite A, Simi Valley, CA 93065-6200

Laboratory ID: 101661
Issue Date: 09/01/2010

The laboratory is approved for those specific field(s) of testing/methods listed in the table below. Clients are urged to verify the laboratory's current accreditation status for the particular field(s) of testing/Methods, since these can change due to proficiency status, suspension and/or revocation. A complete listing of currently accredited Industrial Hygiene laboratories is available on the AIHA-LAP, LLC website at: http://www.aihaaccreditedlabs.org

Industrial Hygiene Laboratory Accreditation Program (IHLAP)

Initial Accreditation Date: 09/01/1994

IHLAP Category	Field of Testing (FoT)	Method	Method Description *(for internal methods only)*
Core Program Testing	Gas Chromatography	NIOSH 1450	
		NIOSH 1457	
		NIOSH 1500	
		NIOSH 1501	
		NIOSH 1550	
		OSHA 07	
	GC – Diffusive Sampler	OSHA 07	

The laboratory participates in the following AIHA-LAP, LLC-approved proficiency testing programs:

- ☐ Metals
- ☐ Silica
- ☐ Asbestos
- ☐ Bulk Asbestos
- ☐ Beryllium
- √ Organic Solvents
- √ Diffusive Sampler (3M)
- ☐ Diffusive Sampler (SKC)
- ☐ Diffusive Sampler (AT)
- ☐ WASP[1] (Formaldehyde)
- ☐ WASP[1] (Thermal Desorption Tubes)
- ☐ Pharmaceutical Round Robin
- ☐ Compressed/Breathing Air Round Robin
- ☐ NVLAP (determined at the time of site assessment)

[1] Workplace Analytical Scheme for Proficiency

NELAP - RECOGNIZED

CALIFORNIA STATE

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM BRANCH

CERTIFICATE OF NELAP ACCREDITATION

Is hereby granted to

COLUMBIA ANALYTICAL SERVICES, INC.

2655 PARK CENTER DRIVE, SUITE A
SIMI VALLEY, CA 93065

Scope of the Certificate is limited to the
"NELAP Fields of Accreditation"
which accompany this Certificate.

Continued accredited status depends on successful
ongoing participation in the program.

This Certificate is granted in accordance with provisions of
Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **02115CA**
Expiration Date: **12/31/2011**
Effective Date: **1/1/2010**

George C. Kulasingam

Richmond, California
subject to forfeiture or revocation

George C. Kulasingam, Ph.D., Chief
Environmental Laboratory Accreditation Program Branch

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM - NELAP RECOGNIZED
NELAP Fields of Accreditation

COLUMBIA ANALYTICAL SERVICES, INC.
2655 PARK CENTER DRIVE, SUITE A
SIMI VALLEY, CA 93065
Phone: (805) 526-7161

Certificate No.: 02115CA
Renew Date: 12/31/2011

114 - Inorganic Chemistry of Hazardous Waste

114.103	001	EPA 7196A	Chromium (VI)	
114.106	001	EPA 7199	Chromium (VI)	
114.240	001	EPA 9040B	Corrosivity - pH Determination	Aqueous Only
114.241	001	EPA 9045C	Corrosivity - pH Determination	
114.250	001	EPA 9056	Fluoride	

State of Florida
Department of Health, Bureau of Laboratories
This is to certify that
E871020

COLUMBIA ANALYTICAL SERVICES, INC. - SIMI VALLEY
2655 PARK CENTER DRIVE, SUITE A
SIMI VALLEY, CA 93065

has complied with Florida Administrative Code 64E-1,
for the examination of Environmental samples in the following categories

AIR AND EMISSIONS - EXTRACTABLE ORGANICS, AIR AND EMISSIONS - VOLATILE ORGANICS

Continued certification is contingent upon successful on-going compliance with the NELAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are cited on the Laboratory Scope of Accreditation for this laboratory and are on file at the Bureau of Laboratories, P. O. Box 210, Jacksonville, Florida 32231. Clients and customers are urged to verify with this agency the laboratory's certification status in Florida for particular methods and analytes.

Date Issued: July 01, 2011 Expiration Date: June 30, 2012

Max Salfinger, M.D.
Chief, Bureau of Laboratories
Florida Department of Health
DH Form 1697, 7/04
NON-TRANSFERABLE E871020-08-07/01/2011
Supersedes all previously issued certificates

Columbia Analytical Services

FLORIDA DEPARTMENT OF HEALTH

Rick Scott
Governor

H. Frank Farmer, Jr., M.D.,Ph.D.
State Surgeon General

Laboratory Scope of Accreditation

Page 1 of 5

Attachment to Certificate #: E871020-08, expiration date June 30, 2012. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E871020 **EPA Lab Code: CA01527** **(805) 526-7161**

E871020
Columbia Analytical Services, Inc. - Simi Valley
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Matrix: Air and Emissions

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1-Trichloroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,1,1-Trichloroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,1,2,2-Tetrachloroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,1,2,2-Tetrachloroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,1,2-Trichloro-1,2,2-trifluoroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,1,2-Trichloro-1,2,2-trifluoroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,1,2-Trichloroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,1,2-Trichloroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,1-Dichloroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,1-Dichloroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,1-Dichloroethylene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,1-Dichloroethylene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2,3-Trimethylbenzene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
1,2,4-Trichlorobenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2,4-Trichlorobenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2,4-Trimethylbenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2,4-Trimethylbenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2-Dibromo-3-chloropropane (DBCP)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2-Dibromo-3-chloropropane (DBCP)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2-Dichloro-1,1,2,2-tetrafluoroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2-Dichloro-1,1,2,2-tetrafluoroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2-Dichlorobenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2-Dichlorobenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2-Dichloroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2-Dichloroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2-Dichloropropane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2-Dichloropropane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,3,5-Trimethylbenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,3,5-Trimethylbenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,3-Butadiene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,3-Butadiene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,3-Dichlorobenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,3-Dichlorobenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,4-Dichlorobenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program. **Issue Date: 7/1/2011** **Expiration Date: 6/30/2012**

FLORIDA DEPARTMENT OF HEALTH

Rick Scott
Governor

H. Frank Farmer, Jr., M.D.,Ph.D.
State Surgeon General

Laboratory Scope of Accreditation

Attachment to Certificate #: E871020-08, expiration date June 30, 2012. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E871020 **EPA Lab Code:** CA01527 **(805) 526-7161**

E871020
Columbia Analytical Services, Inc. - Simi Valley
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Matrix: **Air and Emissions**

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,4-Dichlorobenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,4-Dioxane (1,4-Diethyleneoxide)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,4-Dioxane (1,4-Diethyleneoxide)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
2,2,4-Trimethylpentane	EPA TO-15	Volatile Organics	NELAP	7/9/2010
2,2,4-Trimethylpentane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
2-Butanone (Methyl ethyl ketone, MEK)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
2-Butanone (Methyl ethyl ketone, MEK)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
2-Hexanone	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
2-Hexanone	EPA TO-17	Volatile Organics	NELAP	7/9/2010
4-Ethyltoluene	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
4-Methyl-2-pentanone (MIBK)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
4-Methyl-2-pentanone (MIBK)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Acenaphthene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Acenaphthylene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Acetone	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Acetone	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Acetonitrile	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Acetonitrile	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Acrolein (Propenal)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Acrylonitrile	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Allyl chloride (3-Chloropropene)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
alpha-Methylstyrene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Anthracene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
a-Pinene	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Benzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Benzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Benzo(a)anthracene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Benzo(a)pyrene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Benzo(b)fluoranthene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Benzo(g,h,i)perylene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Benzo(k)fluoranthene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Benzyl chloride	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Bromodichloromethane	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Bromodichloromethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Bromoform	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Bromoform	EPA TO-17	Volatile Organics	NELAP	7/9/2010

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program. **Issue Date: 7/1/2011** **Expiration Date: 6/30/2012**

Columbia Analytical Services

FLORIDA DEPARTMENT OF HEALTH

Rick Scott
Governor

H. Frank Farmer, Jr., M.D.,Ph.D.
State Surgeon General

Laboratory Scope of Accreditation

Attachment to Certificate #: E871020-08, expiration date June 30, 2012. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E871020** **EPA Lab Code:** **CA01527** **(805) 526-7161**

E871020
Columbia Analytical Services, Inc. - Simi Valley
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Matrix: **Air and Emissions**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Carbon disulfide	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Carbon disulfide	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Carbon tetrachloride	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Carbon tetrachloride	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Chlorobenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Chlorobenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Chloroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Chloroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Chloroform	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Chloroform	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Chrysene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
cis-1,2-Dichloroethylene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
cis-1,2-Dichloroethylene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
cis-1,3-Dichloropropene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
cis-1,3-Dichloropropene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Cyclohexane	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Cyclohexane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Cyclohexanone	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Dibenz(a,h)anthracene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Dibromochloromethane	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Dibromochloromethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Dichlorodifluoromethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Dichlorodifluoromethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Di-isopropylether (DIPE)	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
D-Limonene	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Ethanol	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Ethanol	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Ethyl acetate	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Ethylbenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Ethylbenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Ethyl-t-butylether (ETBE)	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Fluoranthene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Fluorene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Hexachlorobutadiene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Hexachlorobutadiene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Indeno(1,2,3-cd)pyrene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007

Columbia Analytical Services

FLORIDA DEPARTMENT OF HEALTH

Rick Scott
Governor

H. Frank Farmer, Jr., M.D.,Ph.D.
State Surgeon General

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Laboratory Scope of Accreditation

Attachment to Certificate #: E871020-08, expiration date June 30, 2012. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E871020 **EPA Lab Code:** CA01527 (805) 526-7161

E871020
Columbia Analytical Services, Inc. - Simi Valley
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Matrix: Air and Emissions

Analyte	Method/Tech	Category	Certification Type	Effective Date
Isopropanol	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Isopropyl acetate	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Isopropyl alcohol (2-Propanol)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Isopropylbenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Isopropylbenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Methyl bromide (Bromomethane)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Methyl bromide (Bromomethane)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Methyl chloride (Chloromethane)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Methyl chloride (Chloromethane)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Methyl methacrylate	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Methyl tert-butyl ether (MTBE)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Methyl tert-butyl ether (MTBE)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Methylene chloride	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Methylene chloride	EPA TO-17	Volatile Organics	NELAP	7/9/2010
m-Ethyltoluene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Naphthalene	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Naphthalene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Naphthalene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
n-Butyl acetate	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
n-Butyl alcohol	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
n-Butylbenzene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
n-Decane	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
n-Dodecane	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
n-Heptane	EPA TO-15	Volatile Organics	NELAP	7/9/2010
n-Heptane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
n-Hexane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
n-Hexane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
n-Nonane	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
n-Octane	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
n-Octane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
n-Propylbenzene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
n-Undecane	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
o-Ethyltoluene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Phenanthrene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
p-Isopropyltoluene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Propylene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program. **Issue Date: 7/1/2011** **Expiration Date: 6/30/2012**

Columbia Analytical Services

FLORIDA DEPARTMENT OF HEALTH

Rick Scott
Governor

H. Frank Farmer, Jr., M.D.,Ph.D.
State Surgeon General

Laboratory Scope of Accreditation

Attachment to Certificate #: E871020-08, expiration date June 30, 2012. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E871020 **EPA Lab Code: CA01527** **(805) 526-7161**

E871020
Columbia Analytical Services, Inc. - Simi Valley
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Matrix: Air and Emissions

Analyte	Method/Tech	Category	Certification Type	Effective Date
Pyrene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
sec-Butylbenzene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Styrene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Styrene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
T-amylmethylether (TAME)	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
tert-Butyl alcohol	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
tert-Butylbenzene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Tetrachloroethylene (Perchloroethylene)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Tetrachloroethylene (Perchloroethylene)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Tetrahydrofuran (THF)	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Tetrahydrofuran (THF)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Toluene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Toluene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
trans-1,2-Dichloroethylene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
trans-1,2-Dichloroethylene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
trans-1,3-Dichloropropylene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
trans-1,3-Dichloropropylene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Trichloroethene (Trichloroethylene)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Trichloroethene (Trichloroethylene)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Trichlorofluoromethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Trichlorofluoromethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Vinyl acetate	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Vinyl chloride	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Vinyl chloride	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Xylene (total)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Xylene (total)	EPA TO-17	Volatile Organics	NELAP	7/9/2010

PERRY JOHNSON LABORATORY ACCREDITATION, INC.

PJLA

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc., has assessed the Laboratory of:

Columbia Analytical Services, Inc.
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

(Hereinafter called the Organization) and hereby declares that Organization has met the requirements of ISO/IEC 17025:2005 "General Requirements for the competence of Testing and Calibration Laboratories" and the DoD Quality Systems Manual for Environmental Laboratories Version 4.1 (4/22/2009) and is accredited in accordance with the:

United States Department of Defense
Environmental Laboratory Accreditation Program
(DoD-ELAP)

This accreditation demonstrates technical competence for the defined scope:
Environmental Testing
(As detailed in the supplement)

Such testing shall only be offered at or from the address given above. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation Body's duty to observe and comply with the said rules.

For PJLA:

The validity of this certificate is mandated through ongoing surveillance.

Tracy Szerszen
President/Operations Manager
Perry Johnson Laboratory Accreditation, Inc. (PJLA)
26555 Evergreen, Suite 1325
Southfield, Michigan 48076

Initial Accreditation Date:	Issue Date:	Revision Date:	Expiration Date:
January 11, 2010	January 11, 2010	April 29, 2011	January 10, 2012

Accreditation No:	Certificate No:	Page No:
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Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Columbia Analytical Services, Inc.
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Accreditation is granted to this facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous	RSK 175	GC/FID	Methane
Aqueous	RSK 175	GC/FID	Ethane
Aqueous	RSK 175	GC/FID	Ethene
Air	(CAS S.O.P.) VOA-EPA3C	GC/TCD	Hydrogen
Air	(CAS S.O.P.) VOA-EPA3C	GC/TCD	Oxygen
Air	(CAS S.O.P.) VOA-EPA3C	GC/TCD	Nitrogen
Air	(CAS S.O.P.) VOA-EPA3C	GC/TCD	Methane
Air	(CAS S.O.P.) VOA-EPA3C	GC/TCD	Carbon Dioxide
Air	(CAS S.O.P.) VOA-EPA3C	GC/TCD	Carbon Monoxide
Air	(CAS S.O.P.) VOA-TPHG_TO3	GC/FID	Total Petroleum Hydrocarbons Gasoline (TPHG)
Air	(CAS S.O.P.) VOA-TPHG_TO3	GC/FID	JP-4
Air	(CAS S.O.P.) VOA-TO3C1C6	GC/FID	C1 - C6+
Air	(CAS S.O.P.) VOA-TO3C1C6	GC/FID	Ethane
Air	(CAS S.O.P.) VOA-TO3C1C6	GC/FID	Ethene
Air	(CAS S.O.P.) VOA-TO3C1C6	GC/FID	Methane
Air	(CAS S.O.P.) VOA-TO3C1C6	GC/FID	n-Butane
Air	(CAS S.O.P.) VOA-TO3C1C6	GC/FID	n-Hexane
Air	(CAS S.O.P.) VOA-TO3C1C6	GC/FID	n-Pentane
Air	(CAS S.O.P.) VOA-TO3C1C6	GC/FID	Propane
Air	(CAS S.O.P.) VOA-TO3C1C6	GC/FID	Propene
Air	(CAS S.O.P.) VOA-TO3C1C6	GC/FID	Total Volatile Petroleum Hydrocarbons (TVPH) as Hexane
Air	EPA TO-15	GC/MS	1,1,1-Trichloroethane
Air	EPA TO-15	GC/MS	1,1,2,2-Tetrachloroethane
Air	EPA TO-15	GC/MS	1,1,2-Trichloroethane
Air	EPA TO-15	GC/MS	1,1-Dichloroethane
Air	EPA TO-15	GC/MS	1,1-Dichloroethene
Air	EPA TO-15	GC/MS	1,2,3-Trimethylbenzene
Air	EPA TO-15	GC/MS	1,2,4-Trichlorobenzene
Air	EPA TO-15	GC/MS	1,2,4-Trimethylbenzene
Air	EPA TO-15	GC/MS	1,2-Dibromo-3-Chloropropane
Air	EPA TO-15	GC/MS	1,2-Dibromoethane

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Columbia Analytical Services, Inc.
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Accreditation is granted to this facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Air	EPA TO-15	GC/MS	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)
Air	EPA TO-15	GC/MS	1,2-Dichlorobenzene
Air	EPA TO-15	GC/MS	1,2-Dichloroethane
Air	EPA TO-15	GC/MS	1,2-Dichloropropane
Air	EPA TO-15	GC/MS	1,3,5-Trimethylbenzene
Air	EPA TO-15	GC/MS	1,3-Butadiene
Air	EPA TO-15	GC/MS	1,3-Dichlorobenzene
Air	EPA TO-15	GC/MS	1,4-Dichlorobenzene
Air	EPA TO-15	GC/MS	1,4-Dioxane
Air	EPA TO-15	GC/MS	1-Butanol
Air	EPA TO-15	GC/MS	2-Butanone (MEK)
Air	EPA TO-15	GC/MS	2-Ethyltoluene
Air	EPA TO-15	GC/MS	2-Hexanone
Air	EPA TO-15	GC/MS	3-Ethyltoluene
Air	EPA TO-15	GC/MS	4-Ethyltoluene
Air	EPA TO-15	GC/MS	4-Methyl-2-Pentanone
Air	EPA TO-15	GC/MS	Acetone
Air	EPA TO-15	GC/MS	Acetonitrile
Air	EPA TO-15	GC/MS	Acrolein
Air	EPA TO-15	GC/MS	Acrylonitrile
Air	EPA TO-15	GC/MS	Allyl Chloride
Air	EPA TO-15	GC/MS	alpha-Methylstyrene
Air	EPA TO-15	GC/MS	alpha-Pinene
Air	EPA TO-15	GC/MS	Benzene
Air	EPA TO-15	GC/MS	Benzyl Chloride
Air	EPA TO-15	GC/MS	Bromodichloromethane
Air	EPA TO-15	GC/MS	Bromoform
Air	EPA TO-15	GC/MS	Bromomethane
Air	EPA TO-15	GC/MS	Carbon Disulfide
Air	EPA TO-15	GC/MS	Carbon Tetrachloride
Air	EPA TO-15	GC/MS	Chlorobenzene
Air	EPA TO-15	GC/MS	Chloroethane

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Columbia Analytical Services, Inc.
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Accreditation is granted to this facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Air	EPA TO-15	GC/MS	Chloroform
Air	EPA TO-15	GC/MS	Chloromethane
Air	EPA TO-15	GC/MS	cis-1,2-Dichloroethene
Air	EPA TO-15	GC/MS	cis-1,3-Dichloropropene
Air	EPA TO-15	GC/MS	Cumene
Air	EPA TO-15	GC/MS	Cyclohexane
Air	EPA TO-15	GC/MS	Cyclohexanone
Air	EPA TO-15	GC/MS	Dibromochloromethane
Air	EPA TO-15	GC/MS	Dichlorodifluoromethane
Air	EPA TO-15	GC/MS	Dichlorodifluoromethane (CFC 12)
Air	EPA TO-15	GC/MS	Diisopropyl Ether
Air	EPA TO-15	GC/MS	d-Limonene
Air	EPA TO-15	GC/MS	Ethanol
Air	EPA TO-15	GC/MS	Ethyl Acetate
Air	EPA TO-15	GC/MS	Ethyl tert-Butyl Ether
Air	EPA TO-15	GC/MS	Ethylbenzene
Air	EPA TO-15	GC/MS	Hexachlorobutadiene
Air	EPA TO-15	GC/MS	Isooctane
Air	EPA TO-15	GC/MS	Isopropyl acetate
Air	EPA TO-15	GC/MS	Isopropyl Alcohol
Air	EPA TO-15	GC/MS	m-&, p-Xylenes
Air	EPA TO-15	GC/MS	Methyl Methacrylate
Air	EPA TO-15	GC/MS	Methyl tert-Butyl Ether
Air	EPA TO-15	GC/MS	Methylene Chloride
Air	EPA TO-15	GC/MS	Naphthalene
Air	EPA TO-15	GC/MS	n-Butyl Acetate
Air	EPA TO-15	GC/MS	n-Butylbenzene
Air	EPA TO-15	GC/MS	n-Decane
Air	EPA TO-15	GC/MS	n-Dodecane
Air	EPA TO-15	GC/MS	n-Heptane
Air	EPA TO-15	GC/MS	n-Hexane
Air	EPA TO-15	GC/MS	n-Nonane

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

**Columbia Analytical Services, Inc.
2655 Park Center Drive, Suite A
Simi Valley, CA 93065**

Accreditation is granted to this facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Air	EPA TO-15	GC/MS	n-Octane
Air	EPA TO-15	GC/MS	n-Propylbenzene
Air	EPA TO-15	GC/MS	n-Undecane
Air	EPA TO-15	GC/MS	o-Xylene
Air	EPA TO-15	GC/MS	p-Isopropyltoluene
Air	EPA TO-15	GC/MS	Propene
Air	EPA TO-15	GC/MS	sec-Butylbenzene
Air	EPA TO-15	GC/MS	Styrene
Air	EPA TO-15	GC/MS	tert-Amyl Methyl Ether
Air	EPA TO-15	GC/MS	tert-Butanol
Air	EPA TO-15	GC/MS	tert-Butylbenzene
Air	EPA TO-15	GC/MS	Tetrachloroethene
Air	EPA TO-15	GC/MS	Tetrahydrofuran
Air	EPA TO-15	GC/MS	Toluene
Air	EPA TO-15	GC/MS	trans-1,2-Dichloroethene
Air	EPA TO-15	GC/MS	trans-1,3-Dichloropropene
Air	EPA TO-15	GC/MS	Trichloroethene
Air	EPA TO-15	GC/MS	Trichlorofluoromethane
Air	EPA TO-15	GC/MS	Trichlorotrifluoroethane
Air	EPA TO-15	GC/MS	Vinyl Acetate
Air	EPA TO-15	GC/MS	Vinyl Chloride

End of Document